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7598. In English, on paper : written in the latter half of the 18th or early in the 19th cent. : $9\frac{3}{4} \times 8$ in., (vols. 1–2) iii +ii +332 +321 + 366, (vol. 3) ix +626 leaves.

'Lectures on Anatomy by Alexander Monro, M.D. Vol. 1', with 2 more vols. They contain 123 lectures on anatomy, surgery and comparative anatomy, written on one side of the leaves.

Bought from Grant, Edinburgh, Jan. 1917.

These appear to be the lectures of Monro secundus who gave a full course every year from 1759 to 1800. From 1800 to 1807 he delivered part of the course, his son Alexander (1773–1859) completing it, and in 1808 he gave the introductory lecture only (D. N. B.). The style of writing suggests an earlier date than that of Monro tertius, and at the beginning of lecture ii there is reference to a change in the arrangements 'from some years ago'. Monro secundus was also much interested in comparative anatomy.

MS. lecture note-books of the late 18th and early 19th centuries are common, particularly those of the Edinburgh teachers and of the Hunters in London. The professors repeated year by year the same lectures, often without change, and a good set would be copied and passed on from one student to another, a custom which prevailed when I was a student at McGill, 1870–2. A set of 'Mickie's' (MacCallum's) was in use that had been taken 8 or 10 years before.

W. O.

7598 vol 1

Bought. Grant. Edinboro.
Jan. 1917. 6s.

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LECTURES
on
Anatomy
By
Alexander Monro, M.D.
Vol. I.

6126

Lecture 1st

When you consider, Gentlemen, y. Office of a Physician, or y. Scope of Medicine, which undertakes to preserve health, & to cure y. diseases, i.e. to prevent, or to reduce disorder in y. human frame it must surely appear evident to you, that y. foundation of this Science consists in y. just knowledge of y. Structure, powers, y. properties of y. several organs by which our functions are performed in health; and this knowledge being acquired by cutting asunder, dissecting y. parts of y. body, or y. art conveying it, is termed Anatomy, & should imply, not merely that y. dissection is conducted in a skillful manner, but y. further every experiment & aid, art furnishes is called in, to disclose both y. Structure & Animal Oeconomy.

The Physician applies his knowledge of Anatomy in two very different ways, viz. either by a proper direction of y. play of y. machine, he enables it to resist such impressions as might prove hurtful; or, to modify it to irregularities however produced, or, to subdue, or expell such matter, as, when received, disturbs, or interrupts

simple the functions, or it were clear of wheels of life, or in a more simple & mechanical manner by of assistance of of hand & instruments, he endeavours to palliate or cure diseases. In of first of these ways hein said to perform of office of of Physician, in of other he exer it. as of Province of of Surgeon. The dependence of both pronounces upon Anatomy will very evidently appear to you on of slightest reflexion.

For unless of Physician knows exactly of situation, of connexion of of several organs of course, termination of of several vessels their divisions, & how far these divarications may affect of body, considered as a Hydraulic engine, the nature of particular degrees of sensibility, of sympathy of one part with another, & of each with of whole, of powers of motion, of importance of each organ to of general welfare, of manner & cause of its action it will be impossible for him to understand of real of an animal divided or to lay down rational Indications for removing it, or even to adapt of general effect of a remedy to of nature of of part

on which

(cumstances.

The acquaintance of these Circumstances to the Surgical part is still more apparent, & will shew the Circumstances of the Subject may be more immediately (consequences of fatal) seen unless he is intimately acquainted with several Circumstances before enumerated, & more especially with the situation & connexion of parts, it will be difficult for him to determine how far an operation will be Eligible, i.e. whether the patient will run more risque from the disease committed to nature than he would do from the operation. May not a case be so determined without previously to be done, I would allege that the Surgeon will be in general prepared to his study of Anatomy, seeing that common share of dexterity & hand is sufficient for most operations, & an operation being nothing but a dissection performed on a living person, you will readily assent to this. So an Anatomist who has never seen a particular operation done, can venture to undertake it with greater

guides apply them a Surgeon who is ignorant in
Anatomy, that he may know when it. Nor is success
upon certain principles, even if nature, & time
alone, sometimes where the most skilful caution
& if any thing unforeseen happens, he knows
how to remedy it. The other only imitates certain movements, & has not a thousandth
part of the reason of them, & if he meets
with out of the common way, or any thing more
difficult than he must be quite at a stand.

Besides we are to consider that without
Anatomy the manual part of Medicine can
make little further progress than to cure those
cases which accidentally present, & may
contribute, with success, to the improvement
of Anatomy & Surgery how useful an
uniform practice.

It is not however sufficient for the
practice of medicine to understand the structure
of the body in a sound state, we ought likewise
to be informed of the changes that are produced
by diseases. For altho' from knowing
the various functions, & organs performing
them in health, we are enabled often to

to

( ) our discussions wt respect to ye nature of diseases, yet in treating ye that alone we must be often led into mistakes. So if without paying any attention to ye effects, which a change of place, alteration in diet & conversation, produce in diseases, we shall often be deceived wt respect to them. We shall afterwards find yt our several organs and in general measures composed of branches of ye same hydraulic system, wch a diversity primarily influencing owing to organ, may in various degrees be communicated to others, or to all. Sept. thus we shall be able to prosecute ye theme in question & point belonging to it, yet we shall be far from being able to ascertain ye nature of ye medium by which ye nerves operate & by means of which ye communication is maintained between ye living & corporeal part. add to this that ye living principle, influenced by a single organ, may react over all in a way we cannot from ignorance of our nature reduced to rule.

Spence

hence we see plainly y^e impossibility of know-
ing y^e nature of diseases from mere
reasoning, or a priori, one half we must begin
for from y^e top of y^e chain by which y^e great
Author of nature unites cause & effects, &
that we must have recourse to observation
by dissection, theorie by misleading y^e cure
we must be misled in y^e cure. Thus if we
put y^e most favourable circumstance, y^t
by giving a certain remedy you remove a
complaint or symptom, yet if you are ig-
norant y^e cause, your observation does
not admitt of general or future practice?
because y^e cure must be varied according
to y^e number of causes, that can produce
y^e same general appearance, so an Anas-
tomotic kinde of dropsy depends upon
a variety of causes, many of which de-
mand a directly opposite method of cure
. Nay when we put y^e most unfavourable
supposition, y^t we know from
(dissections, y^t certain symptoms &
complaints proceed from incurable (di-
seases of y^e viscera), yet have our
know-

knowledge is not only available to surgeons but is equally available to physicians, but it is of value to physicians, as instead of performing this operation, which attempts a radical cure, we endeavour to palliate symptoms, and to assist nature, by diversion in effecting relief, knowing that we understand that physical cause which produces obstruction of the circulation, as when nervous influence is affected, or a taint communicated to the mass of blood, because this becomes a cause of further disorder which is discoverable by dissection. So I may conclude in the words of the ingenious Celsus. "Neque enim, cum dolor illuc incidit, scire quid doleat, cuivis qui quia parte quodque viscus infestius, nunc vitio non cognoverit credendum, sed, cum medicorum quem imperitia quoque non fefellerit. Incidere igitur morborum causa discentibus necessarium, nam possibilem evadunt, nisi quæ debent." To inquire further into the importance of Anatomy to the

new.

several branches of medicine would be impro-
per, because I am bound to suppose, that you
know y^e contrary w^ch respect to many, y^t
you are entirely ignorant of y^e whole, & every
step as we proceed with farmuch attention and
precaution. Therefore I shall proceed to com-
(mit y^e most fit method of acquiring Anat-
tomical knowledge. Then I have made it a
rule of late years to lay aside almost y^e form
of preliminary Lectures, & to fasten to
them y^t are useful & practical, as I imagine
that our time can be not only more use-
fully employed, but more agreeably upon
y^e subject itself.

It will at y^e first sight appear
evident to you, y^t an allempt to investigate
not only y^e Nature, but y^e Functions of
animated bodies must meet w^th consid-
(erable difficulties. Not only y^e consistence
ce of y^e most delicate, & at y^e same time
complicated mechanism, but that of sensible
ce powers, such as return upon each other
in a circle, so y^t we are at a loss to distin-
guish between cause & effect, with-
out

ly^e

life continues for a length of time, w.ch almost imp.
impress upon, & because we find that y.e operations of y.e body are guided & wonderfully
influenced by y.e living principle, which we
yet we can not understand.

How multiplicity of people are incumbered
connected together in y.e same Spot how generally
the Physicians to cure y.e obscurity into two circumst.
cumstances, y.e one a misapprehension of things
long strictly so called, y.e other y.e Prejudices
any. The former is always employed in
describing y.e parts of y.e machine, whilst y.e
latter endeavours to show in what manner
from what cause it performs its functions.
Now, omitting what there can be profitable
be observed, it is evident y.t y.e procedure
of either is attended w.t uncommon difficulty.
For if I mean merely to describe y.e parts, it
is evident y.t I cannot lay them before you, &
attempt to join them together to compleat y.e
whole, neither can we analyse y.e body w.t
advantage, till you are made acquainted
w.t its having. If I make an opening in
y.e skin, I discover an Organ called a

muscle

muscle. I may describe the figure & situation of it, but without the knowledge of the nerves, you cannot judge of the use or force we must employ a more compound method here than in describing other pieces of Mechanism. Again when we proceed to the Physiology it is difficult to distinguish cause from effect. If we consider the heart as a pumping machine we observe that the heart receives its energy continually from the brain, & the brain again its influence from the heart. What I have mention'd in a very general way may be sufficient to point out the necessity of pursuing a proper method. For this reason we defer explaining the Anatomy before we enter upon the Functions of the organs to Dry & disagreeable, and we cannot allow so long descriptions without having in view the application of them. Besides in the Physiological part we are surely best enabled to judge of the use of the parts, whilst they are in view before us. So it is material to adopt a method, which whilst it leads us on in a gradual way, does not torture for granted

granted any thing that has not been demonstrated, & in describing y structure, we shall have such an eye to y functions that they may be explained as we proceed, & that at y same time y application to y practice may be pointed out. With these views I shall proceed in y following plan &c.

After giving a general history of y nerves & y progress of Anatomy, & pointing out y chief causes of improvement, & method of pursuing books, I shall lay before you y principal materials of which our body is composed, endeavouring to explain y use of each & y manner of connexion, we shall then have a general idea of y Animal oeconomy, then will follow such an introduction begin more immediately to understand what is to be proposed y use of y several parts, from y dependence of one part upon another, & upon y whole. We then proceed with more accuracy & less reserve to the Osteology of the Basis of y body, explaining y structure of y bones, & along with these y parts connected with them &c

The

The Senses lead naturally to ye muscles, & these organs which connected to ye brain, & possessing a natural power, enable us to perform our various motions, of which we shall give an account as far as may seem useful.

The knowledge of ye bones & of ye muscles furnishes a full & distinct outline by which we can describe ye situation & connexion of all ye other material organs, of ye organs of ye senses, ye glands, ye viscera.

After we know ye general use of each class, ye particular character & office of each organ in ye class we are prepared to enquire upon ye system of ye body, in a more general explanation, & entertaining light, as composed of parts connected, & communicating, & all conspiring to form one system or whole. And as we shall have found ye nourishment we take in is conveyed into ye vessels that contain ye blood it is evident ye ye blood wch ye nourishment must be in motion from one to all ye parts, we will be led therefore to

& trace this motion & we will find that by means
of y^e heart, arteries & veins, these humours
are carried together in circles.

In enquiring more further into
these most obvious than circulation & pulse-
sation of y^e vessels, for knowing off y^e motion
parts, for lubricating all y^e parts in our
various motions, & allowing an easy play
& motion to ye necessity for a communi-
cating apposition, to drain y^e cavities, to pre-
vent their distension, & y^e putrifaction of
the blood, which is presumed by some to
generally named by Anatomists & even than
structure Valvulæ Sympathetic, but y^e
nature being misunderstood by Systematic
Writers, we shall find y^t y^e doctrine con-
cerning them has generally been placed
in a false imperfect view, than it merits.

To complete y^e description of an
Animal, it remains that we should de-
scribe organs, by means of which a com-
munication can be maintained between
y^e body & mind, by which y^e mind can
be rendered sensible of impressions made

on

on y^e^ body, or of injury done to it. Your muscles enable the person to their motions. Accordingly we shall find y^t^ there is a power dispersed from y^e^ brain to y^e^ nerves on which both y^e^ organ of sense & of motion depend.

After considering y^e^ general properties of y^e^ circulating, y^e^ absorbent & y^e^ nervous system, we shall proceed to trace y^e^ functions of each to their termination, observing y^e^ effects which these have upon y^e^ various organs & when at length we shall have perceived y^e^ manner in which y^e^ arteries convey nerves, enter an organ, & y^e^ manner in which y^e^ veins & other vessels convey from it we are ready to disclose the structure by y^e^ assistance of various preparations & then as far as can be done with certainty we shall endeavour to determine the office, taking care at y^e^ same time to distinguish between just theory & vain Hypothesis. We conclude then our investigation of y^e^ body, of y^e^ various organs, after having seen y^e^ source of these primary systems in y^e^

y modification of which is mainly dependent in a great measure upon

After explaining the structure of the organism in a sound state by parts of morbid bodies we I have prepared, I shall give you an idea of the changes, which the parts undergo by diseases, so as to make a foundation of the practical Anatomy, or Anatomical Pathology, of the importance of which, I have already warned you. Besides the above-mentioned in Surgery, as well as in Physiology, which will be introduced into the Anatomical part of the Course, I shall treat as a distinct branch of Surgery, or all the diseases or accidents, that admit of palliation, or Cure by Surgery, and after showing the changes made from morbid preparations, I shall lay down the indications of Cure, then showing the Instruments I shall perform all the operations before you on the subject, with an after application of the Bandages, & machines used in Surgery. The importance of this part will lead me to mention particular

cular attention to it, especially as I mean to prove that from Analogical considerations in many or many occasions venture to correct ye practice of Surgery, as being immediately dependent upon Analogy.

And now having finished ye consideration of ye human body, I shall in a few lectures illustrate ye more obscure functions by ye comparison of ye Analogy of ye animals of ye other Classes. And having thus obtained every means of throwing light upon ye functions, I shall conclude with a few lectures on such parts of ye Physiology, as ye demonstration did not lead me to attempt.

Yrs: &c.

At our last meeting, Gentlemen, after endeavouring to point out to you ye importance of Analogy in Physic & Surgery I laid before you ye plan we are to follow in ye present Course. Upon ye whole I propose besides showing ye structure to explain ye use to you ye Physiology of ye several organs, as far as it admits

admit of application to ye practice, to shew on many occasions ye changes produced by (de-
cause, we are to lay some foundation for ye
practical Anatomy, or Anatomical patho-
logy; to treat, as a distinct branch of Sur-
gery, on ye those accidents, or diseases wch
admit of alleviation or cure by ye hand or
instruments, or to perform before you wch ye
operations wch ye after treatment by means
of bandages & Machines, & I gave you some
reasons for my beginning wth ye History
of Anatomy, or wth tracing ye rise & pro-
gress of ye art. ⁂

Some years ago, I used to treat of
this part minutely, & endeavoured not only
to point out ye general cause of ye several
Writers, but their chief discoveries, but
of late years, I have abridged this part
greatly, in order to make room for ye
practical part of ye course. In prosecuting
ye History I shall follow nearly ye order
of time, for that this in several respects
is less entertaining, from ye want of
connexion, in that no art or science has
attained

attains the perfection in y same manner in which it is best taught, yet this answers y purpose of History. For while we satisfy our curiosity in examining y steps by which y several discoveries were made & carried forwards, we do justice to y improvers of y art, & derive advantage by which our knowledge may be improved, by pointing out y way in which practical writers in different ages have proceeded.

As y antiquity of a science gives a presumption of its importance, so Writers generally trace that they profess as far back as possible, pointing out every circumstance that might contribute to its origin or improvement. But as such enquiries are but of little use, & even but little entertaining, from y obscure uncertainty attending them at y distance of y time in which they are placed, I shall pass that y first ages in a very cursory manner.

We are not however here, as in many parts of knowledge, allowed to indulge in conjecture, but we are tied down

come by y. Sacred writings, which especially tell us that y. Sons of our first parents offered up Sacrifices long before they were indulged in y. use of Animal food, in which as well as in Butchery, when flesh was permitted to Noah, an accurate division of parts was necessary. In Sacrifice certain parts were laid aside as impure, & others reckoned particularly proper for y. service intended, while other parts again were allotted to y. Sacrificers, & in y. Butchery of y. larger Animals, an equal division is necessary, & when y. world came to be more peopled, jealousy, avarice & ambition soon embroiled mankind in wars, & we read very early of battles, in which y. victors of y. body would be more frequently laid in view, than they are now, from their using chiefly sharp pointed, and cutting weapons. When men came to be better provided w.t y. necessaries of life in society, & to be indicted by fame, their necessity & leisure would lead them to attend to many things they had neglected the[y]

thought of, & among other things we find that they endeavoured to prevent the bodies of those who had made a figure in life, after their death. This practice was familiar to the Egyptians in the time of Herodotus, & from the term, Mummy, this practice seems to have taken its rise among the Romans, Mum in their language signifying wax, with which the bodies were closed & this practice is of an ancient date as Herodotus lived 400 years before Christ. But no such very accurate knowledge of Anatomy could be derived from this practice as some persons if you look into Herodotus, you will find that the operator was obliged to extract the Bowels piece meal, that the body might not be mangled, but this joined to the occasional inspection of wounds must have confirmed Mankind in the Analogy between the Structure of their own body & that of quadrupeds, at length we find the Priesthood an artificious set of powers, & ingenious in devising the means of obtaining it, pretended the future events were revealed to them by certain signs, & tokens, and that these

more

more revealed to them more especially (even in
valuable in y^e world) such Illuminations were
opened in sacrifice & y^e credibility y^t How have
long place w^t y^e profession of y^e important
nothing of importance was undertaken w^tout
consulting y^e Augurs or Haruspices. This too
was begun among y^e Eastern nations & took
place among y^e Romans from y^e building of
Rome & from thence it is thought that Analo-
gy must have received great improvement
y^e knowledge of y^e key in y^e sound state being
necessary in order to point out every deviation
from a healthy st^e. But if you look
into S^t Simon who relates all y^e miracles
by which Heaven was supposed to have attested
& disclosed itself to y^e Roman people
you will find that in one case y^e heart
was wanting, in another instance two
hearts were found so that y^e whole was
a mere illusion, or a few of y^e Bowels were
only examined.

There are y^e chief means, which
for many ages must have instructed
y^e human understanding knowledge of Analogy
for

for neither in y. Greek writings, nor in y. Latin
of Roman, Remains or Translations can we find
that Anatomy was considered as a science of use
& entertainment, nor are y. Names of Vesalius
celebrated for their knowledge of Anatomy, but
merely for their skill in y. writings & compli-
ments to y. curiosity of y. Princes.
The length of curiosity of y. Princes
gave occasion to many for y. further im-
provement of Anatomy, by admitting it into
their studies as one of y. branches of natural
philosophy, & Galen's introductory Demonstrations
& art made considerable improvements in
Anatomy, & soon after we are indebted to Hip-
pocrates, for having detached medicine as
a distinct science in profession from y. study
of Philosophy; & on all occasions he consi-
ders Anatomy as y. foundation of medicine.
With regard to y. exact degree in which
y. skill of Hippocrates as an Anatomist
is to be rankred, I find very great differ-
ences among writers. Some blindly ad-
mirers Antiquity pretend to find in
him almost all y. Anatomical knowe-
ledge y. is useful, whilst others despise

ciate

ciat his skill on y^e effects of it
as I can observe from a careful perusal of his
writings in different places we may venture to
allege that in all he seems rather to understand
y^e value of y^e art, than to possess it. For
his knowledge is extremely superficial in many
material points, & in some circumstances
he is highly erroneous, so he confounds y^e
arteries & veins, not only under one general
name of Vessels, but frequently understands
them to be different branches of y^e very same
trunk. In like manner he confounds y^e ten-
dons w^th y^e nerves, & his notions w^th regard
to y^e latter are so extremely imperfect, y^t he
ascribes y^e office of nerves & muscles to y^e two
vessels. I am far from finding w^th Galen
a clear evidence that Hippocrates ever dissec-
ted y^e human body, but y^e proof of it mention-
ed by Galen as decisive, His describing y^e
bring y^e substance of muscle, to lye one upon
an other, because we find this muscle in those
which was y^e common Anatomical method
of y^t age & Country, The examiners
of Hippocrates not contented w^th ascribing
an,

an accurate knowledge of ye structure of it. but ye [illegible]
him have pretended that he discovered ye nature
of ye blood, & even ye consequence depending upon
that ye theory of Inflammation. But ye exact
degree of his knowledge in these respects will
be best discerned hereafter, when we come to ye
full discovery of ye Circulation, which shall
lay before you at one view, all that was known
in former ages on ye very subject wch at
this discipline make very considerable
progress in Anatomy in parts belonging to
them, that ascribed to Hippocrates, viz. that
ye human body was now dissected. The
exact number of ye Vertebræ is mentioned
& of ye bones that compose ye Sinus, & there is
an Analogy drawn between ye structure of
ye Alimentary Canal of a Man & of a Dog.
Diaphragma & Peritonæum distinguished
Intestines from ye Veins, assigning ye name
of Artery to ye bearing vessels upon ye supe-
position that they contained air, or Spirit
& yet notwithstanding he thought to judge
of ye state of ye body, & particularly of
ye blood by feeling ye pulse & in this era

Was mentioned by Galen a curb compared by it's
elevating manner of Dissection than which we
can have no clearer proof of y. frequency of such
omission at y. time ( )

We are now come down in y. History to y.
time of Alexander y. Great, or to y. 3d. Century
before Christ, when we find great improvements
made in Anatomy by Aristotle himself, or
by his ingenious Preceptor Aristotle, whom
he provoked to compose a Natural History
of Animals, & we are told by Pliny that he
compleated this undertaking in 50 Books
or Volumes of which 8 are still extant. Un-
luckily those which were immediately made
of y. Dissections of y. Anatomy of Animals
have perished, but in those which remain
we find numerous marks of considerable
skill, And Aristotle attempted to illustrate
his descriptions by figures, an art which
tho' extremely obvious, and of unspeakable
use was overlooked by his successors, &
when it was revived again near two thou-
sand years thereafter was considered as
a new invention ( )

We

We are ignorant of ye studies & Evolu-
tions in a great measure, altho' this peo-
ple almost all we know, of ye Greek Phi-
losophers travelled into different parts for their
improvement, & yt in Egypt ye Egyptians
were confined to ye care of a single disorder
by which it is supposed that they must have
acquired a considerable knowledge.

But, before ye Birth of Christ, an Acade-
my of ye arts & sciences, was instituted at
Alexandria, by ye Ptolemies, ye successors of
Alexander, which subsisted 1000 years, &
which was so highly cultivated, yt we are
told by Celsus & Galen, yt ye Strange Revo-
lutions were sometimes observed at ye Disse-
tions, & in ye works of Galen we have an
account of many of ye Alexandrian Anat-
omists, but of which more immediately
merit our attention, namely Herophilus
& Erasistratus. These persons have treated
accurately of ye Human Structure, & have
pointed out Evacuations, which have
been ascribed to ye latter writers. How
they both describe ye nerves conveying
ye

y. monument, what we call y. Sacral vessels, they both separate y. nerves from y. tendons & by accurate & curious experiments shew their true office. They have also described y. several parts of y. heart, & given many name to different parts of y. body, which are retained at this day.

Medical knowledge seems to have been at a very low ebb in y. Romans for many ages, for all the accounts after y. days of Hippocrates, we find mention made of Medici, yet in reality their Physicians were Slaves or freed men who practiced empirically & without any tolerable knowledge of Anatomy or Surgery, & without rational principles. Nor doe'st clearly y. any person living more immediately under y. dominion of y. Romans & in Italy practiced Anatomy before y. Division Ora, Nor the Celsus in his very excellent Book de Re medica considers Anatomy as y. foundation of Physic, & before he treats of y. inward diseases, he premises a Chapter de Corporis humani aedibus internibus, & he describes y.

Vessels

Vesalius & Fuchsius opinion touching corpus humanum & his description the should are in a great measure correct, But ye greater part thereof by no means ye whole of this work is borrowed from ye Greek Physicians, & near two centuries have elapsed after ye birth of Christ before we met w^th original improvements in ye arts & sciences. During ye dark Century Fuchsius & Saracenus wrote but original tracts.

Last we have a very elaborate work composed by Galen, which contains not only ye learning of ye foregoing ages, more especially that of ye Alexandrian School, but it was enriched by a description, drawn from dissections, of ye various organs of animals compared on many occasions w^th ye human body, not however always. And he has not only anticipated ye moderns in many discoveries, but in such which are supposed to be of a much later date; in some cases he enriches ye subject by accurate observations, he throws light upon ye functions of ye Organs, particularly upon ye motion of ye blood, & ye impost of

of y^e pulse. & that two months can skill be wch entertainment, & not wt. Inoculation.)

Yet upon y^e whole his opinion in gen^l in new Hypothesis, but they were concealed rationally into a System y^t he was intirely followed for 11 Centuries, that they have been justly laid aside long ago, as being in general full of vallies Antiquarian Fancies.

In y^e 11th Century y^e Roman Empire was over-run by barbarous nations, and learning in a great measure extinguished in y^e Western parts while in y^e East, y^e Physicians continued to follow Galen, & had but little knowledge in Anatomy. We have in this period y^e names of Aetius, Paulus & Alexander.

In y^e 5th Century Alexandria was taken by y^e Emperor of y^e Arabians, or Saracens. The Academy founded there & which had subsisted near a thousand years, was entirely dispersed, & celebrated Library of 700000 volumes & y^e learning in y^e Eastern parts of y^e World almost entirely consumed. When how-

ever

ans of ye Romans were quietly settled in their conquests, we find them looking to ye remains of ye Greeks & Roman writers, by degrees translating them into their own language, & even adding some new discoveries as ye small pox & measles, w.ch some new remedies ye produce of their own Country: but in Anatomy they made no improvement at all by ye Rules of their Religion, a person after touching a dead body is supposed unclean.

It lasts in ye 11th Century, for in all ye Sciences we meet w.th prodigious Chasms from ye Superstition which overwhelmed Europe during that period. But in ye 11th Century Academies began to be established in Europe, ye Salerno by ye Arabians carrying over their knowledge to ye Western parts, & Montanino Gaveda (Mansour) is handed down as having first taught Anatomy in Europe. Academies & Universities were instituted in Italy & at Montpelier in France, only they confined themselves w.th reading ye works of ye Arabians & in ye following Century we

we met with a decree of y. German Emperor, Frederic y. 2d, ordering Anatomy to be taught, and preventing any person from practising Physic who had not studied it. For, several Ages however y. Professors contented themselves w.th commenting on y. Writings of y. Antients, so that from y. time of Galen, i.e. for near a 1000 years, y study of Anatomy was far from making improvement or progress had been gradually loosing ground. For y. writings of y. Greeks & Romans had been in a great measure forgot, and of consequence improvements neglected, while y. writings of y. Arabians which were very imperfect, were substituted in their place...

At length in y. beginning of y. 14th Century, an Original work was published by Mundinus in y. 1315, & that his descriptions are, not only extremely superficial, but inaccurate, & his style rude, yet his Book was so highly esteemed, that by an order of y. Senate of Venice, y. Professors of Padua, were obliged to teach that only, which gave occasion to abundance of Commentaries upon it...

Before y. middle of y. following Century

tury, i.e. in y. 11th, y. Art of Painting was discovered, & nearly about y. same time, Constantinople y. seat of y. Eastern Empire, was taken by y. Emperor of y. Turks, & in consequence of them learning was revived, & diffused over Europe by y. Learned Men who fled from y. tyranny of y. Turks, & carried y. original writings of y. Greeks & Romans along with them into y. Western parts of it, so that now y. number of Books comes to be great, & before y. end of y. Century, we have several very tolerable Compends of Anatomy, particularly by Guido & Benedictus.

In y. succeeding Century y. 16th we find y. spirit of improvement continued, several new discoveries made by Nicolaus Massa &c. But their merit is in a great measure eclipsed by y. Writers who immediately succeeded them, Vesalius, Sylvius, Fallopius, & Eustachius, perhaps I may add Columbus, who in a few years contributed more to y. real knowledge of Anatomy than had been done in all y. former ages.

Vesalius is said to have shown a very early Genius for Anatomy & after y. ad-

vantage

vantage of diving at different Universities he
was appointed Professor at Padua in y 23d year
of his age. Here first published his Epitome of
Anatomy & then his larger work, viz. Fabrica
in which in a clear, neat & elegant style
he describes y. various organs of y. body, teaching
his reader to follow him by dissection & explain
his descriptions by Tables, which are admired
to this day by Painters as well as Anatomists
& every where he discovers a servile
attachment to Galen & Hippocrates, of y. me-
rit of which we can have now no perfect con-
ception. Y. y. eleve of his work we have many
experiments made upon living Animals
in order to determine y. use of y. Parts
particularly wt respect to y. motion of y.
blood, which merit our highest attention.
His merit drew upon him y. envy of his
co-temporaries, but they were at length forc'd to
imitate him. Servetus attempts to correct and
improve upon Ptolemy, as Vesalius, as also, wt more
candour & accuracy Fallopius & Eustachius.
y. former correcting y. Text, whilst y. latter
guides him by composing a System of Tables,
wch

which lay long hid, are now found after the beginning of the present Century & they are the most excellent & fit to be studied by anyone

We are now advanced to within about 150 years of the compleat discovery of the Circulation by Dr Harvey. But as the great outlines of the Body & the various organs were now tolerably well described, & the Oeconomy still remained mysterious, the History becomes much less interesting, so that I need not mention the new Anatomical Authors who published after this, especially as I may refer to the Theatrum Anatomicum of Caspar Bauhine, who was remarkable for his knowledge in Botany as well as in Anatomy, & who has disposed the several improvements in the end of his System.

Anatomical knowledge was now more general in Europe. Fabricius Aquapendente & Casserius improved upon one another in the University of Padua; while learning was drawn from Italy to the Northern parts & made a System was published at Paris by Riolan, which was for many years the common standard of Anatomy.

Your

. Sair experiments were more frequent & accurate
In y^e. 1676 we have described y^e. manner in w^ch
A nourishment is conveyed to y^e. Body by Ves-
sels in Vegetation. Suther, he happening to shew
some Friends, Dogs, diverted upon y^e. surface
of their Intestines, from y^e. membrane connecting
y^e. Intestines to y^e. Body called. Mesentery, cer-
tain vessels very different from y^e. arteries &
veins formerly known. When he opened
y^e. (dissection) direction in which y^e. liquors
they contained moved, he found w^th his finger
that he could press it forwards towards y^e.
heart, towards y^e. other parts of y^e. body
but he met w^th insuperable resistance in
giving it y^e. contrary direction. On repeating
this experiments, he remarked y^t. y^e. colour
of y^e. Contents varied according to that of y^e.
Contents of y^e. Intestines. Of y^e. Intestine
containing water, they were clear & trans-
parent; Of y^e. Intestine containing Aliment,
ment, which consists of a mixture of air
& water, which gives it an opacity, they
are not pellucid, but of a white colour, as
he found y^e. y^e. liquors they contained was

cond. y

curiously wrote in ye form of Journal (that if we were ye first Writers of Anatomy, we shall find some traces of such a discovery, or ye description of them in ye writings of those, who lived & flourished, but then they were not sufficiently prosecuted by either, & seeming unintelligible to their Contemporaries, as well as to their successors. Notices have ye same merit, as if no hint had been formerly given concerning them. An account of ye Lacteals was published in ye 1627. And

In ye year 1628 Dr. Harvey published his work (de motu Cordis et sanguinis, in which he proves a doctrine he had known for many years before, That ye arteries & veins communicate by their extremities, or rather that ye extremities of ye arteries make ye beginning of ye veins. Thus suppose we right arm to represent an artery & ye fingers ye branches into which it is divided, Dr. Harvey has endeavoured to prove that these reflected from ye veins, or ye joining ye hands imitate an artery corresponding w^th a vein. The conclusion therefore

thereof that in those vessels of the [illegible] circle, constantly & regularly, [illegible] so as it can perfectly circulate, &c. That if you make a ligature upon an artery, or press upon it, it swells, & beats on y^e side of y^e ligature next to y^e heart & not on y^e other side, as you cut it y^e blood in discharging from y^e side next to y^e heart, But if on y^e contrary, y^e blood come out y^e vein, it swells underneath y^e ligature & upon making a vein both above y^e ligature & beneath it, that under y^e ligature only discharges y^e blood freely, & this motion is circular constant & rapid, for when one fibre y^e next y^e stricken quickly succeed to each other.

This Doctrine which at once overturned y^e Theories at y^e time, as well as many former Systems, explained a material part of y^e human Oeconomy, & paved y^e way for y^e discovery of many important truths, did not fail to draw upon its author numberless adversaries, who first endeavoured to disprove his doctrine, but not being able to maintain y^e truth of his System, they next endeavoured to invalidate it by saying

that

other Author, & in this enquiry is not to rest upon 38
me, as if I gave no more credit to y^e Translation
Authors of different age, I shall give you some
account of it; as far as it may seem necessary
to my learned Author (Harmer) in
y^e Annotations I come under more strict
obligation to prove y^t y^e Circulation was known
to the Hippocrates, & by quoting detached passages
from y^e different parts of his works, they
seem to give some appearance of truth to their
opinion. But if you consider these in y^e
spirit, & not in y^e real translation of y^e words
Hippocrates's ideas will appear different.
Hippocrates believed that y^e blood was not
in a stagnating state but in motion & he
specially uses y^e word περιοδος for expressing
y^t it goes about. But then when he
comes to explain y^e motion, he compares it to
y^e waves of y^e sea, he supposes that y^e
blood passes to & fro in y^e same vessels &
y^t he uses y^e expression ὁ τὸ αὐτὸ κίρνας
ἐστι, y^e body is a circle, he is so far from
explaining y^e Circulation by it, that he means
to say, y^t the Circulation is inexplicable
y^t

that he neither could give beginning nor end,
so that thro proues his ignorance of ye Circulation
& what expresses his accurate knowledge in that
respect, not only (even he apply'd ye name of
Philosph to arteries as well as veins, but he con-
ceives there to be different branches of ye vena
port. they he supply'd himself, in ye meaning
to show, why ye one branch beats, & ye other does
not. Further he pays little or no attention to ye
pulse in diseases, which a person acquainted
wt ye Roman Apolon, could not fail to have
done, & from ye want of this circumstance I
cannot help inferring to allege that ye discove-
ries of diseases given by Hippocrates are to be
accounted than ye common powerful admiration
of Antiquity would lead us to believe.)

After Hippocrates we give ye inven-
tion of ye Circulation ascribed to Aristotle, Herophilus
Erasistratus, Erasistratus &c & to those last
mentioned chiefly on account of ye accurate
description they have given of ye heart, of
its Valves more especially, or blood vessels, &
their use in directing ye blood in one way.
(But they were not acquainted wt ye full

use

nor of the Values, & of accuracy with which they
shd verify, & superadd they two, every person
does not foresee y consequences, that follow
summary opinion to establish, we are not,
to argue from Servetts showing y nature of
y Values in y heart, that the discovery of Cir-
culation, nay in other parts of his works, he
speaks in a vague manner of y way of y mo-
tion, Gravitation & Attraction have never
still less claim, according to Stevens, Gravitation
proves that when y blue passes into artery
it may in an unnatural state be as impure
in as the new quæ spiritus accommodate sunt
transfunditur sedem fieri. He supposed y
vapour that y name of artery was put
y y valves conveyed y air to breath, & imag
ined y blood rushed in because of Vacuit
um ad ent, & Redemption more particularly in-
sists upon y necessity of altering y names
given to y pulmonary & Vein, that they re-
semble y valves & Veins in y rest of y
body, yet he thought y pulmonary artery per-
mitted y office of a Vein & that y Vein served
for an artery, so he mean y Trunc of Valvia

Venosa

known, & from whence i.e. Hippocrates in
declared that y^e right side of y^e heart dispen-
ses y^e blood to all the organs, whilst y^e left
cavities furnished y^e spirit, & he was led into
that idea from y^e dissection of y^e heart where
he found no hole in y^e partition for a communi-
cation; & on y^e right side he found y^e vein
distended w^th blood, while in y^e left y^e artery
was empty, the muscular powers pushing y^e
blood forwards before death.

The Doctrine of Galen concerning y^e mo-
tion of y^e blood has been considered as diffe-
rent from y^e Harveian System, that he has not
been mentioned as an opponent, & yet sufficient
evidence more than can be collected, what
could at a circulation then can be found in
Hippocrates, or any other Author, & it is mat-
ter of great use as well as curiosity to know
his ideas.

He also out of y^e refutation of Gra-
tiolus & Fracastor who thought that y^e
arteries conveyed a spirit he says they con-
vey blood. He had found us in opening y^e
Arteries in living persons in which he

mad

man Heart, as y opening of y temporal artery ;
but as Erasistratus might say, that y moment
y artery is opened y spirit escapes, & y blood
rises in to fill up y void, he kept two pieces of
in two places & finds it distended w blood, so
he speaketh justly w regard to Aristotle, & he
is y first, & not Paulus, who divides them into
two & false, and he observes that both are owing
to y blood accumulated in y arteries, or effused
from them, He kept attends to y division
of y arteries at their extremities, observes y
interruption of their communication w those of y
Veins, & he supposes that there is a communi
cation betwixt them, that they are joined at
their extremities, He knows that when a liga
ture was drawn upon a member, y
Veins swelled under y ligature, Following
y Veins to y heart, he found no holes in
y partition, according to y ancient doctrine, &
that there was nothing to prevent y blood
from passing into y pulmonary, nay that y
Valves have a contrary effect, so he teaches
yt y blood passes from y heart into y
lungs, & from them goes back into y left
side

vice of y. heart. If therefore we consult y. ve- 43
neral observations of Galen; we seem to perceive
a knowledge of y. Circulation. But Galen no
where joins his experiments in order to deter-
mine y. direction of y. blood, he throws them
out in an unconnected manner, wt. out drawing
y. proper consequences. Nor, when he is treating
more immediately of y. bloody motion, he
says, it sometimes passes from y. arteries
into y. veins, but y. it often times passes
y. contrary way from y. veins back to y. ar-
teries, he says that y. veins receive their
blood by an inherent power of dilating them-
selves, not that it is pushed into them, but
so when we draw a pair of Bellows, y. air
rushes in, & when speaking of y. veins, that
he is forced to allow y. there is a motion from
y. small veins into y. larger, so that y.
veins of y. Alimentary canal carry y. nourish-
ment to y. liver; yet he supposes y. in ge-
neral it passes from y. larger branches of
y. veins to y. smaller, & in treating of
y. mesentery, he supposes y. y. blood
passes to & fro, as his ideas upon y.
whole

while are very inconsiderable, & he had by no means yt. most distant notion of yt true motion of yt. blood.

The most to whom yt discovery is attributed are yt Chinese Physicians. When China was first visited by yt Europeans, they are said to have discribed yt Circulation by a word of progressive & yt Circular motion, & they observed them very attentive to yt pulse. But to this day, you will find that yt Chinese Physicians are so far from understanding that regular motion, that they feel yt pulse at different parts in different diseases, not supposing yt frequency of it to be yt same in all.

After yt Chinese Physicians, yt writers of yt 16th Century have been quoted as they: Salviccius who composed his works towards yt end of it. But all their descriptions are to be found in Galen, & seem to be translated from him; except that of Costinus Physician to yt Pope, who says that when we are awake yt heart sits yt arteries, & yt when we are asleep it passes from yt

y. vale ioo into y. Veins, which he conclud'es from
y. Veins being more distended in him after
using y. greater Degree of exercise, & to y.
respiration not going on so fast whereby a
greater stop is put to y. Circulation of y. blood
in y. Lungs. And Lower admits that
sometimes y. blood is driven from y. Veins back
into y. arteries & speaking of y. Nature of y. heart
he says, that there are two on y. one side, while
there are three on y. other, that y. blood might
pass from y. heart to y. veins respectively, unless
valves of y. Lungs.

Here y. Learning he he ascribes to Nature
since from his ascribing y. same use to
many particularly their Nature, but he did
not foresee every consequence that follows
y. ascribing y. right use of them, they
when he has assigned y. use of y. valves
mistook & supposed that they carried y. blood
to y. heart, he says that they hinder y. blood
from being driven from y. large trunks of
y. Veins into y. smaller, respecting y. use
moves as Galen did.

So that y. only person who can be reckoned

as a complete w.ch Harvey, & when on first y.
permeate made in order to ascertain this point
in Harvey, for in his system you will
not merely an Hypothesis concerning y. blood's
motion, but his opinion is supported by experi-
ment, & if you merely mean any. just by
advances, you are led w.t y. utmost evidence
to y. formation of y. circulation, yet Harvey
was far from seeing y. consequence of his
own observation, Harvey in y. birth of
this Anatomy, joins Galen against & never
values, in shewing y.t y. arteries naturally
contain blood. He not only saw y.t this
is discharged from them when cut, but he
repeats y. experiment applying y. artery in
two places, & cutting out y. intermediate
piece. He next endeavours to confute Galen
w.t respect to his idea of y. cause, & manner
of y. motion of y. arteries, he endeavours to
show that y. arteries are dilated because
they are filled, & not filled after they are
dilated, his proof in this, he calls an argument
ad ignorantiam, & finds y. dilatation & motion to
continue in y. part connected w.t y.
nerve

heart but that it arose in y. chest on the upper y. incision, & but it should be so, a medicament might be ready to allege that by cutting y. artery we had deprived it of its living power, he repairs them by means of a tube & finds y. motion restored in y. distant part. Hence he shows evidently that y. artery is pulsing, is passive. He proceeds further to observe y. correspondence between ye dilatation & y. contraction of y. heart. He describes y. motion of y. latter to take place when y. heart is laid in view, that when y. heart contracts y. artery swells out. He knew that a vast quantity of blood is cast from ye artery in a very short space of time, he recollects in his figures of branches of y. arteries, wiped w. those of y. veins, & suspected y. a communication takes place between them, he knew that when a ligature was thrown around a vein, it swelled under y. ligature, & tracing y. vein into y. heart, he describes y. circulation & use of y. several valves, or flood gates, & w. is plain he denies that there are tubes in y.

y. Septum, & he concluded that y. blood passed by y
y. right side of y. heart, & by y. pulmonary artery
into y. lungs, He still proceeds further, and
performs a curious experiment, which has been
availed to D.r Keats, (For y. experiments of
Vocation have been strangely overlooked
by Malebranche, & he has not even been quo-
ted as a competitor w.t Harvey) he lays open
y. thorax of a living Animal, & observed y.
y. lungs collapsed, and that after this y.
motion of y. left side of y. heart ceased, be-
cause y. blood was hindered to pass, & as a
proof that this was y. reason, he fixed a tube
in y. wind pipe, & inflated y. lungs, when
he observed that y. Animal revived, y. mo-
tion of y. heart was again restored, & it
contracted as before w.t violence, y. motion
of y. arteries corresponding to it. Now,
from this we are led to conclude that
there must be a circulation. For if we fairly
establish y. facts of y. y. arteries contain
blood, that y. blood is moved in them
w.t celerity & rapidity, that y. heart
throws a great quantity into them, that
y.

y. blue stream towards y. heart, & consequently there will
y. lungs: if we subject it y. eye might y. better
circulation, we should misconstrue y. Author,
yet so far is this from being y case, that in
immediately after he proposes experiments upon
y. veins, & then he tells us that it is needless
to make any for y. y. motion of y. blood in
them is sufficiently understood, namely that
y. blood moves from y. trunks to y. extremities,
from y. heart outwards, & what is
almost incredible, he to himself obviates
an objection, you will ask, says he, why do
not y. veins beat? but he answers that
by saying, that it is owing to y. thinness
of their coats, yet in y. same page he
endeavours to prove y. pulsation of y
artery does not depend upon y. coat, but
upon y. stroke communicated to y. heart
so we certainly cannot find in y. History
& Physic a more clear proof of y. danger
of Hypothesis, that by acquiescing in it
we are prevented from investigating truth
by observation & experiment, as these
we have done so of drawing y. 7 chaos.

consequences, as ye honour is evidently due to
Harvey of having first fully disclosed ye manner
of ye Circulation, & it is likewise plain
that he had more merit in acting ye truth
than ye prejudice in favour of ye Aristotelic
System of Galen, than if he had made ye
discovery without having read or known any
thing upon ye subject.

Vol: 3d

I gave you an account of ye Works of Harvey
being ye first origin of ye science, viz
ye discovery of ye Circulation by Dr Harvey
& last that occasion of saying before yt
all that had been known in different ages
concerning this very curious subject, as being
not only entertaining but useful.

We now find learning (diffused from
ye Universities of Italy & France), once ye
chief seats of Europe, & in no long time Philo-
sophic Societies were instituted, of which ye
Royal Philosophical Society of London is
ye most ancient, that included medicine
in its plan. In this it was imitated by
ye French & Germans, & now we find

ours

such Societies established in almost every Com-
ty Hospital of Europe, & in y. space of about 50
yeare, imperfect Dissections continue to be
made, Particularly y. Dissections of Arteries
are confirmed, not only in Quadrupedes, but
in human bodies, y. Valves are seen, wch
was a matter at that time of y. almost im-
ment, as y. reality of Circulation & conviction
of them, had been called in question by many
particularly by Harvey himself, at y. same
time Regret made y. Lacteals to y. Thoracic duct
of which be only an obscure Description had been
given, & y. use of it was not known.)

Soon thereafter, but still within 20 years
after Harvey published, a compleat System of
Vessels was discovered by Rudbeck & Bartholine,
which from their valvular structure
& y. lymphatic appearance of their contents
were named y. lymphatic Vessels.)

And, not only were y. principal Or-
gans of y. body now known, but Oeconomy
was in a great measure disclosed. The
Distinction was made by Malpighius, be-
tween y. arterious & Veins, & new y. course

of

of y^e blud, & of y^e Eyes now known, & y^e proper office of y^e nerues now found out by Microscopes & Anatomies. We now discouer also that y^e pursuits of Animalcula seem back a very different turn, & instead of endeauouring to couerle y^e large mazes of y^e body, they throw light upon its functions by new & curious experiments, particularly Malpighius & Leeuwenhoek in y^e lyse & Lungs & Bellini. By injection we only discouer y^e surface of things but they now attempted to unfold their texture.

(By maceration they separated y^e septum of y^e Nerues' parts, they noted y^e changes made by disease, they compared a variety of animals w^th each other, they injected coloured liquors into y^e vessels, & carefully applied y^e Microscope, so that they opened us a new field of minute Anatomy, which is not only highly curious, but extremely useful, & Leeuwenhoek showed a most beautiful Lupus of vessels from had been received by former writers. But y^e number of Pores is now so multiplied, that it would require more time to give a particular

particular account of them, Hence arose a curiosity 33
upon them. So I shall proceed to reveal some of
them as I imagine are of most necessary
use for your perusal, & but this may not
afford much entertainment, yet knowledge is
so very necessary to beginners, that I hope it
will draw their attention.

It is very evident that in every
Science, Books must be of very considerable
moment, that it must be acknowledged
that in words, & even assisted by delineations
it is impossible to convey much an idea of
a Creature of any Body as is necessary in
our practice. There are many things which
if not of a private nature, it
is difficult to find a true colour, & this im-
possible to give handsome & convenience
of different organs, & most Sciences
teachers find themselves at a loss, & feel
our beginners as poor Lyolen & Jerome
reasons. Men are qualified for teaching
any Science in its full extent, & still few
are willing, or have leisure to under-
take so of a Creature, & in Anatomy there is
a

a reasonable [illegible] of the materials required for
a perfect [illegible] of the subject is
highly [illegible] in his own power
that no person [illegible] should [illegible]
be [illegible] a description of the body in the full
extent, do we have recourse to numbers
[illegible], & to the latter for descriptions of the parts
& figures from another, to whom perhaps
other parts little or no regard, but [illegible] an
[illegible] complete knowledge of the whole
we are obliged to have recourse to many books
yet at first beginners should use but few.

When they enter on a course of Anatomy, they would wish to acquire some general knowledge of it, & then may be [illegible]
[illegible] well done by a perusal of the [illegible]
[illegible] wants, where the descriptions there
[illegible] are tolerably accurate; & they are explained by very distinct figures. The
11th 5th & 6th Edition are more valuable
than the foregoing.)

After getting a general idea of the
[illegible] about to attend lectures where it can be
[illegible] minutely, we would strictly [illegible]

...ons tongue & still more accurate work, are
formerly Perhaps were recommended, but he is
now a days obsolete, & from his ignorance of
y. English language, he was even unacquainted
wth materiall instruments, that were made
at y. time he wrote, nor can I venture to re-
commend this book, that it has been repeat-
ly now reedited by Chatsain, by Vaudain, &
lately by Petit & Savin, for we still find
it a paltch work, & you would imagine that y.
figures of y. muscles for instance, were ra-
ther from a block of wood, than from a se-
ction of y. human body. Besides as we
have no translation at all, those Gentlemen
who are unacquainted wth y. French Lan-
guage need some other assistance, & y. best
upon y. whole is y. Anatomy of Winslow
who is by much y. most accurate in point
of description that has ever appeared
in which regard is constantly had to
y. situation & y. connexion, of y. organs
which had been strangely neglected
from y. days of Havelius (downwards
Still indeed there are several usefull re-

wch

which beginners will be apt to make against it, I mean that of describing an organ minutely that it is difficult to follow him. As this Nicolai himself was sensible & he proposed to have afterwards his description by a system of tables which never have been finished. After he described the body merely as an inanimate object considering it as an examination of the practice of Physic & Surgery, as he is equally minute in matters of small consequence, as in others of great importance, & has the French writers in general, are but little acquainted with the anatomy of Malpighius & Ruysch, by whose ingenious discoveries our organs are unfolded. Upon the whole as far as we find his words correct, it is translated by Douglas into English, which is published in 8vo, & we have an edition of it in this place in 8vo. (1)

After we have considered of a full description of any organ, we would further wish to recapitulate the material consequences, & this you will find very

well

well [illegible] Theories in Natural Philosophy
now, to reduce the Descriptions into Tables
in which you have the natural circumstances
of each particular upon enumeration. Then
I can scarcely recommend instead of violent
& warm & Hasty, Hasty but we and inform-
ed by a Father that it was composed
after he had repeatedly compared Nature
& natural, we find him in many respects
very defective. I have already observed a
difficulty of understanding Descriptions without
a Specimen of Plates. However attempted
Illustrations, it will be found to remove
Fancies, Harmonize the Parts than those
you, & make of Theories more universal
ly recommended, & you observe that Fig.
gures are very elegant yet at the same
during a time in which it was composed, this work is more worthy, he
shows too much value of & miracles, where
by he was misled many of & Christians
Dreams heaven too & pains of Men
Animals have been substituted in
stead of & human body. I would there-
fore

the communis intuitus of nature & more & correct & useful methods of this (the improvement & teaching) & give me how his original tables which I was in danger of losing but were entirely recovered by the care & ingenuity. At first sight we are convinced y. y. tables of Evolutions in point of speculation & elegance are infinitely superior to those of Alexander, nor can they well fail to be so, upon y. manner of their construction, first he places before y. painter a Skeleton, then he makes a dissection, & he instructs y. painter attending him self to y. connexion of y. several muscles & instructs y. painter how he should draw y. muscles upon y. Skeleton, without drawing y. parts exactly as they lye before them, Perhaps to conceal this evil, we find another fault in y. system of Evolutions that instead of beginning w.t y. structure of y. Brain, he ends w.t it, so that in studying his tables, we ought to reverse his order, yet such alterations in quiem to y. true situation of y. several organs, & many of y. more minute blood vessels, & nervous

vessels

in truth w.ch you'll care, that Anatomists may agree to prefer these tables even to y.e most accurate works of y.e same kind you have yet perused y.e (as I am published by Albinus with very full & exact explanation, & y.e last & best edition is in y.e year 1761. He throws great light on y.e structure, by forming to y.e system of Eustachius that of Fabricius, w.ch y.e observance of M.r Cowper, though y.e real situation of parts in very much overlooked & an appearance of elegance visibly obscured by studied, yet it contains many things y.t you don't find in Eustachius, & in consequence of y.e great elegance of y.e figures & that of drawings are of y.e natural size we can judge of them more accurately than it is possible to do from Eustachius.

If we mean to prosecute y.e several branches of Anatomy w.th accuracy, a much greater number of Books become necessary, & those I shall explain in y.e order y.t Practice most fit for an Anatomical Course.

He

to imagine y.t y. bones in ye perfect state, & how
we have very sufficient opportunity, I wish we
study y. very bones y. principal part of y.
Davis, & how I may venture to recommend
a small book published by my Father, as
being sufficiently accurate in Anatomy
every where pointing out an application to
practice, & Surgery, more readily to be
commanded at that of late years, how I am
encouraged to y. loyal undertaking at Paris,
how translated this work
in a more sumptuous form than ever before
yt, and to explain y.e descriptions by y.e
figures that are highly elegant, and in
y.e dispositon of y.e figures, to do quite
entirely by his text. I show you y.e appro-
priate pieces of y.e thorax, where each part
how y.r true shape, & y.e whole is represented
to gether so very elegantly and justly,
as almost to resemble nature itself.
you would imagine y.t we could pass y.e
hand w.t in y.e thorax, surely nothing
that painting can give seems in this book
to be wanting. But if you mean to
study

dmy y. delicacy & y. most compleat
Anatomical accuracy y. will
have reason to y. master of Rhimes, when
his Parts & sketch human given a most
minute description. Seemy part where eye
once he stakes, which in fact elegance
nearly resemble those you have seen
in print, accuracy perhaps exceeds them,
they are all of y. natural size.
I know not y. manner in which y.
bones are applied to each other, & tied together
so as to fit them for motion, Ih have very
excellent assistance from Dr. Weitbrecht
in his work published at Petersburgh
in Latin under y. title of Syndesmologia
i.e. an account of y. ligaments, but com-
prehends likewise y. Cartilages, and y.
articulations relative to y. skull bones
& y. descriptions are certainly not only
full accurate, & y. figures are as elegant
as y. subject required. For those parts
you may also read Winslows treatise of
y. ~~wet~~ bones. On y. basis of y. body this
very splendid work of Mr. Cheselden
used

me to be studied, but it is merit equal to
measure taid aside, not only as being to so accu-
rate than Sue as Albinus, but that y.
conspicuous of are extremely superficial, in
so way absolutely trifling. The principal use
use we would recommend y. work is, y.
examining at y. latter part of it some delin-
ations of y. bones in a concave view, wher
you find a number of very curious cases of
their joint.

When y. bones we are naturally led
to examine y. muscles, & here, besides y.
work of Winslow we have excellent assis-
tance, first from Dr Douglas, in an ap-
pendix to accurate piece, & which is at
y. same time very concise, & afterwards
from Albinus in y. 3d & 4th of his Historia
Musculorum, & still later Albinus ac-
knowledges to complete this knowledge by
very elegant tables, & as above to these
he gives what was wanting in y. Notes
have shown, & figures of y. Skeleton
& y. skeleton & tables in which y. mus-
cles are represented are constantly kept
in

in our situation, wherein situation it has been too much neglected by others, Anatomists, upon y. whole this is one of y. most beautiful & curious works that have ever appeared, will in all probability stand y. longest y. test of time. yet some things are wanting, that might render it more useful & for the how not that of a monument on him to represent y. several tendinous membranes, called aponeuroses, w.ch are closely connected w.th y. muscles, (in reality make a part of them, & it is of great use in practice, & for explaining y. action of y. muscles that their situation should be well understood. From want of our attention to this matter, after y. Aponeuroses have been removed, we find in y. table of y. Abdomen & y. fibres of y. muscles represented too smooth, for upon detaching y. Aponeuroses we cut thro' y. fibres of y. muscle, wherein in some places y. fibres are represented longer than they will be found in nature. There is one other circumstance that Albinus has neglected w.th y. Skeleton immediately presents us w.th y. outermost layer of y. muscles

muscles. I saw the dissection, & must say that person's method, & can neither analyse it, nor yet put it together again: but surely this in Italian is very practicable & usual. Albinus has for his first table of the muscles, what should have been a last, he at first have given the Skeleton, & then the muscles one in succession upon the Skeleton, till the whole is completed, & that is the best way of studying them. For a Beginner who is not much used to paintings, may cut them out imitating the dissection, & lay them over each other, as the body is originally covered in the same situation, & so Albinus has unluckily not reprinted his Tabulæ Sceleti & references to his own work, instead of using this large work, you may read Douglas's the tables of Albinus, & you will find much easier followed. Formerly instead of Albinus, recourse was had to the tables of Mr Cowper, assisted with his description. But I shew you them new, not on this account, but the intermixed with the tables we find their particular

proceeded

prevented, for he tells all whom in point to y. new situation, & we find y. muscles contract, when y. only conclusion we can draw in w.ch regard to y. strength of y. muscles, w.ch all knowing their real use, & how far imitating Nature have much exaggerated their action, he has shown more muscles, & greater swelling of them than are ever employed . .)

Having now studied y. bones & muscles, we are fully prepared for judging of y. situation, & y. connexion of all our members & now we have recourse to y. descriptions of Monro w.ch y. figures of Swammerdam, Bidloo, by which we learn y. several bones & y. attachments of y. bones, y. glands & y. organs of y. senses .)

When we are acquainted w.ch y. minute parts which compose our body, we are prepared to proceed to y. examination of it as a System, as having a communication formed between its different parts by means of y. Vascular & Nervous Systems, and beginning w.ch y. heart as y. prime mover we must first study y. Anatomy of y.

y.

nal Organ. To understand the Office & Structure of
the heart, we have very large a foundance, and
very excellent at the same time, from those
that have given us a treatise upon the
heart in which the Heart is employed in
the description of that organ, whilst they
is employed in the Physiology & Pathology
The Anatomical part is rather more diffuse
& prolix than was necessary, but he may re-
gen his subject with such spirit & Dress
that one is led on insensibly, both in the
Physiology & Pathology. He would then treate
of the Course of the blood, & upon this subject he
would take into original work of the
Harvey, which is extremely short, but
perfectly distinct, his arguments are clear
& conclusive, & fully sufficient to prove
what he undertakes, that still later we
have further proofs thereof in Pneu-
tonical Injections, the situation of the veins
& Valves, making the blood pass from one
to another, & acting the motion of the Heart
easie. In prosecuting the particular branch
ches of the blood vessels, we would first
Consult

I would Endeavour to have the more minutely we could consult y. various Anatomici of D.r Haller. But as he did not intend a compleate System, little regard is paid to situation, or to Scale, but in one figure y.e parts are from y.e adult, while in y.e next y.e parts are perhaps from a child, neither are y.e figures in a prospective view, but you have y.e interior of y.e head perhaps not to scale of y.e body or some other, but still however from y.e connection of y.e figures & description, this work is highly valuable I have divided it into two Volumes, w.ch should be universally practiced, Herewith you have under a necessity of turning y.e leaves, & y.e explanation should be in a smaller form: He would trace back y.e blood in y.e veins by y.e tables of Anderlechius, Ridley, & of Cowper w.ch y.e description of Winslow. —

From y.e Circulating System, we are led to y.e absorbent, or y.e imbibing System, I observed to you that y.e Cynaphalic vessels were discovered about y.

y.e middle of last Century, & from their connection y.y
ce to y.e reins, they were supposed to be deriv.d
from y.e antients, but we shall find that they
owed their Contents from y.e several cavities
as you will see in a small work, which I
published in y.e 1707 at Berlin, for an
account of y.e particular Branches, I might
refer to y.e original papers of Rudbeck &
Bartholine, & to y.e works of Nuck upon y.e
subject, I cannot however venture to rec-
commend these, as I suspect that many
of their descriptions are imaginary, and
I would put into your hands a work, pub-
lished by y.e Cel.d Mr Hewson, where
you have a tolerably full account of y.e
Lymphatic System, but on so small a
scale. Formerly I used to refer to y.e
preparations, which I shall have occasion
to shew you, along w.th Ingrannings, w.h
I showed when Mr Hewson himself
attended Lectures in this place: At y.e
same time I must (do him y.e justice)
observe, that his descriptions are not
taken upon trust, but he has traced
traced

traces them by his own Labours, Experience
in general respects he has followed y^e same
Method in some places more exactly than
it had been done before.

It still remains, to compleat y^e general
System of y^e Body, y^t we examine y^e various
Motions we view, y^e motions of y^e Limbs, &
consider y^e powers in Beasts by w^ch such
y^e several muscles, and y^e motions of
y^e Head & Vocal System, it appears ne-
cessary that some short notice be (com-
municated) between y^e Limbs & corpus
which is done by y^e nerves, in this subject
y^e works of Newton mangerously recom-
mended formerly. But he respecting them
singly without any conception w^t y^e effect
parts, or y^t his Sequence in effecting were
in Surgery, & y^e communications between
them which he points out will not illus-
trate y^e Theory concerning them so much as
has been supposed, since y^e Sympathies
which takes place is not owing to these
Communications, but must be assigned
chiefly, & in many instances solely to

them

their common at their origin. I notice however in
of studying this organ, I must recommend first
y. tables of y. instructions, & in some particulars
y. tables published by Dr. Hooke at Gresham
In y. 1705 when I was there, he had tables
of them all, & he only delayed y. publication
till he had more opportunity to compare his
tables w.th nature.

After we have traced y. Vascular &
Nervous System in any organ, we are justly
prepared for dissecting the intimate structure
which depends upon y. mastication & dispos-
tion of these principal parts. We therefore con-
clude our examination of each organ, by allow-
ing to it proper in various ways. But
here we are very much at a loss for assis-
tance, In y. descriptions I must refer
to y. works of y. very learned Dr. Haller
to his primæ Lineæ, & Elementa Physio-
logiæ, & to explain his descriptions we
must have recourse to y. figures given
by Ruysch of y. Structure of y. several
viscera, & which are represented in a very
unconnected way w.th out y. smallest ref.
to

the Eyelid, & some other parts of the orbit throw their light upon it, particularly in the Comparative Anatomy & other works of Figures published by the late very accurate Albinus in his Tabulæ Sceletti, Musculorum &c. but as I shall only explain a small number of the Organs, I must refer here to the observations which I shall make in the Course.

Some few organs require a still more accurate description from the number of minute & curious parts in their composition. Here I especially refer you to the simple coats of the Eye in which the several parts are covered & guarded, & which I did not like to publish the Physiology of the organ, he confines himself merely to the description. then the structure of the Ear, if we are not satisfied with the very detailed works of Scemmering, we may throw some further light upon it by consulting the Tabulæ Cavalium, of the late Albinus Eustachius & Scarpa.

After studying the structure in the perfect state, we would investigate the evolution, the manner in which the several parts

parts are same, & y. differences produced by y.
pleura state, & how we would begin w. y. examin.
observations of Hall's upon y. formation of
y. bones, & of y. Chick; but it is to be regretted
y. we have only his conclusions in words
w.out a sight of ye figures, w.out which
he is not to be easily understood. After
examining y. formation, we pursue y. history
of y. Body in ye different parts of ye thorax
his Oeconomy, in which y. Bones & cartilages are represented w. great elegance. Then
y. Organs proper to y. Fœtus, we have a considerable work by Dr. Hunter (Comment. de diff.
ventilio inter hominem natum & nondum natum)

After thus making ourselves acquainted w.t y. Anatomy of y. Body in a sound state, we would investigate y. changes produced by Disease, in y. works of Morgagni & Sandifort, but particularly in y. former, whose accuracy may be fully depended upon. The works of y. other, tho' valuable, is very deficient in point of accuracy, not only in y. Symptoms, but likewise in y. Dissection.

Hearing

it cannot possibly examine of structure & actions of the human body, we could make some comparison between it & Animals, & find out much understood from of System of Animals of general division of them into classes, to enable us to adapt of proper experiments. For Quadrupeds may refer to Buffon, & for of description of larger Animals may refer you to Blasius, & to of works of Valentini upon of same subject. With regard to Insects you will meet with many curious observations in Swammerdam of last century & point out of application which may be made from these observations, & for myself & also for a proper work, & particularly to recommend a very imperfect one I have of were published from my Father Nature under of title of an essay upon Comparative Anatomy, where there is great room for additions as well as corrections.

We must proceed to of Surgical part & as of best System upon this subject I find no difficulty in recommending of very full work of of late Dr. Sheldon, who has

have also given figures which represent the
give a notion of the shape of the several bones
mentioned we are to explain, & of manner of using
them. After we have considered the subject
at large we would recapitulate what may
be found there by perusing of Surgical Institu-
tions of Palmer or a still later book by
Cadwic his Institutiones Chirurgicæ, which
he composed after he had been in use to lecture
several years in the north of Britain -
Those who study the Practice of Physic & Anat
Surgery may content themselves w.t several
thing either, & I would more especially recom
mend the work of Palmer on account of the
singular beauty & elegance of his Style.

But before we can enter upon the Prac-
tice of Surgery w.t safety, there is a necessity
for having recourse to a variety of situation
For when Hooker published that art had
but lately emerged from a rude state, & of
simple method now used in the treatment
of ulcers, & more especially of Fresh wounds
was then but little known, & of late years
various improvements have been made

more

more especially, of Wounds received by y. French & English Surgeons. In y. Medical & Surgical there are many papers on Surgery by my Father, & many of y. Memoirs he improved there have been inserted by y. other Surgeons. We have also many things relating to Surgery by different hands in y. Memoirs of y. French Academy & several detached pieces by Le Dran Pibrac &c., & of late years we have in this Island a very good operative book by Mr. Thomas, whose descriptions are simple and correct, & he gives tolerable figures of y. several Instruments y. are necessary. We have also upon this subject y. works of Pott, Warner, Gooch, White, Bromfield &c. & one lately by Mr. Hill.

Lect. 4th.

In I propose not only to demonstrate to you y. structure of y. body, but to explain y. use of y. several organs, & point out many of y. changes produced by diseases & on ye occasions to consider this Course as a foundation of practice I mentioned y. necessity before entering w.t accuracy on y. part

ticular parts, of giving a beginner a general idea of the œconomy, form & dependence which each part have upon another, & upon the whole. You surely understand me, that all I mean by attempting a superficial explanation & I shall take very little pains in demonstrating the usual parts, a general notion of them will be sufficient, & indeed supposing by casting out the method I would consider as the best for a System of Physiology, I shall follow one that is perfectly simple, as we are directed by nature herself, & which leads us to overlook the circumstances of small er importance, & to direct our attention solely to general views.

The Vegetable Kingdom more men with the Animal Line, I would venture to allege in certain degree seal. But you have all surely observed that every Animal without exception spontaneously performs certain motions, & these are done with more & more forceful purpose, the Animal will, or by volition is distinguished from the vegetable

(Sa)

S. le y. beg incumbed a principle of life suppose to matter —

The Bodies of Animals consisting a mixture & due proportion of fluids & of solid parts, there must be in a constant state of change y. fluids diffuse, y. solids are alter'd, so to prolong life we perceive y. necessity of a frequent supply being frequently or continually made, & to enable y. Animal to attain what is necessary for it, it must be provided w.th y. organs, or all organs of sense of which we professe ignorance, our not being able to conceive any additional sense, or that other Animals do not professe it, this seems to be y. greatest number of senses in y. Animal Kingdom, & in many Animals there is a defect of some, but that y. Animal may reach what it perceives & judges to be useful to it, (for seeing are so happily situated as to receive their nourishment from y. surrounding Element) it is necessary y. y. Animal should professe y. locomotive power, should be able to transport

ito

the body from place to place, & to fit it for this we must suppose the necessity of a Bursa, a somewhat to support & give attachment to the softer parts of the body, which in our frame we call the bone & in order to save much of the unnecessary load of bone, & to extend the surface of it sufficiently for the connexion of the other Organs, the bones are made hollow, which have occasion to observe more particularly hereafter when we by this means the Bones are rendered also stronger. But the end purpose in the broader Bursa is that we rest upon a larger surface, & there is more room for the attachment of the muscles &c.)

Next it is necessary that the Bones or Bursa should be divided into a great number of parts, or we observe a great assemblage of bones which are fitted to each other, that our motions may be quick & various & in all necessary directions

Next where the Parts are placed & where the bones are intended for play upon each other, it is necessary that none

softer

a soft substance should be interposed to prevent
y^e too great friction, hence when you examine
y^e end of a bone in a recent subject, you find
it tipped w^th a soft matter, what you know
under y^e name of cartilage, a gristle &c y^e mo-
tion of y^e part in a great degree be progressive
& considerable flexion cannot be made w^th
safety, we find y^t y^e bones are immediately tied
together by y^e cartilage, so in a young
subject where y^e cartilage connects y^e tibia
to y^e great bone, or in this way y^e several
pieces of y^e back are connected to each o^r.
But if a larger degree of motion be safe,
at y^e same time necessary & convenient,
we find y^e bones merely tipped w^th cartilage
& when we examine y^e cartilage, we find
it solid throughout, there being no occasion
to save us of y^e bone, this substance being
specifically lighter than bone, & to prevent
them from sliding off one another, we
find them tied together by a strong mem-
brane called ligament, & this to prevent
confine a liquor y^t lubricates y^e extre-
mities of y^e bones. Thus we observe

y^e

y. cause of y. body's first setting forth in any motion.
que it motion it only remains that contractile
organs should be connected to y. different
bones, deducted from one bone to y. other
& these we name from their office, organs
of contraction, muscles, & they are y. flesh
regularly & beautifully divided into parts to
subserve y. muscle to possess y. power of
shortening itself, y. next moveable bone
will be drawn immediately towards y.
more fixed, that y. muscles may more
readily withstand them wch would, were they
& hence a great number of threads or fibres are
required. From this you perceive y. use & y.
softness of y. bones, that by means of
their surface, it gives room for y. attachm.
of y. muscles for their origin or insertion
but suppose a muscle is intended to
move my fore arm for instance, you will
observe that it may be derived from y.
whole extent of y. arm bone, but y. other
extremity must be inserted very near to y.
joint, for if you suppose y. it had been
to a greater distance, upon drawing in

y.

if you view y. muscle would have that ad
like y. string of a bow when drawing any
thing out of y. arm, & y. effect of y. muscle here
in a great measure tho' so most of them
are inserted near to a joint. But as there must
not have been room there for y. reception
so many of y. immediate contractile or
muscular fibres, we perceive y. necessity of
some further interposition, & here which
shall called y. muscular fibres \ join them
to y. bone, & this is done by means of a ligament
or as Anatomists speak a tendon, which at
I show you, running upon y. back of y. foot
or hand, & these are to be considered merely
as y. ligaments of y. muscles, as serving
y. purpose of a rope to a number of men
in moving a large piece of wood, where
there is not room for all of them to assist
y. hand. Nor'd you will consider y. many
y. insertions of y. bones, need to have y. tar-
geol motions, as y. face & jaw, yet there
is not room for bringing sufficient mus-
cles from them, as now we perceive y. ex
tremes or tendons will be obliged to pass over

and all parts of the animal, by means of which
muscles & tendons slacking and thickening
(some by shortning, whereby a muscle has very
small degree of contraction is enabled to
perform a very large motion because the tendon
is but little shortened when the joints are
bended. Thus if the muscles shortning
neth the obliquity of the tendon may cause
one thirtieth space of our Nature.

In this way then we observe the machine fitted for performing motions, & even
alleviating to the situation & conception
of the bones & muscles, the manner in which
our various motions are performed will be
very readily understood. If we mean to ex-
tenuate any violence, you will find the
manner of doing it perfectly unsuited to our
end upon the slightest reflexion. Whilst we
endeavour to fix one part of the body, the
other may be at freedom, & first. When the
whole weight on one of my legs, suppose the
right, by this I give freedom or liberty
of motion to the left, & the flesh being
thereby brought into action, the limb is drawn
upwards

upwards & then allow y. Body to sink down upon
y. best which is brought y. nearer & nearer all at y.
same time y. body downwards falling w.t y. more
slow of y. other Six. y. limbs being not more
than y. limits by y. vertical weight, or
y. body is brought forwards & y. weight gra-
dually thrown upon y. best toes, whereby y.
right is at liberty to repeat y. step.

In this way y. Animal approaches
y. substances necessary for its food. by y. pro-
tance of y. teeth it tears it into pieces & by y.
action of y. jaws it comminutes it still further
& y. internal parts of y. mouth & fauces, y. tongue
& throat being muscular organs by y. same
muscular power it is conveyed w.t in y. body
In y. throat y. fibres are disposed in a circ-
cular manner & y. contraction of one fibre
quickly succeeding y. another, y. food is con-
veyed into y. receptacle we call y. stomach
of Animals which is placed in y. Abdomen
or Belly. (& this receptacle will be found to
have no apparent distinction between y.
Animal & Vegetable Kingdom. For all
Vegetables draw in their nourishment

by

by invisible powers upon y^e surface, whereas
all Animals even y^e lyest & lowest remarkably situated for receiving ills y^t fall upon y^e
surface, yet receive it into y^e stomach)

The Stomach we must first consider, to see
what effects y^e contain y^e stomach, on
viole of a muscular part. & from y^e stomach
we find continued a very long yet a intestine
canal. In y^e subject before you where it is
distended, it appears thin & transparent but
we likewise can perceive in it circular muscular fibres. Into these y^e organic fibres y^e
food is received. Let me readily explain
y^e manner in which y^e muscular
part may be discharged from y^e body of y^e
Animal, y^e contractions of y^e intestines
being continued y^e contents are pushed
~~extruded~~ downwards.

The woolful part undergoes very considerable changes, it is not merely dissolved
& merely filled lowest into y^e body of y^e
Animal, but it must be received into
y^e Animal, that it may be
fit to be received, hence
in explaining y^e changes it undergoes
we

we must keep in view a variety of circumstances not only of mechanical division, how far by chewing, mixture of saliva &c. in the mouth & stomach, acting as mere, as of mere effect of heat warming to soften the food, but we are attentive to have in view a dissolution which is made by the liquors & particles out from the stomach, & various changes we it undergoes by a kind of fermentation, whilst at the same time a quantity of liquor is continually added as it descends in the Intestinal canal, we perceive then the food digested, & rendered fitter for circulation, &c. & part passed thro' the body by the power of the muscular fibres of the Intestines whilst the useful part undergoes change from the Animal liquors added to it. & is absorbed by the large surface which the stomach & Intestinal tube necessarily form & which is increased in a curious manner by a number of rugæ or valves, so proper to detect to a vast number of mouths, or open vessels, fit for taking it in, & prepare not to have the nourishment

from

from y^e elements or Intestines into y^e Constitution
& to attend to y^e manner of y^e reception, how they
will naturally adapt it selfe to y^e Vessels
examine y^e appearance by Speculum Luminis
mater after going thro y^e Cuticula & Cutis
we find myselfe upon y^e surface of y^e Cutis
from y^e Cutis running alongst that membrane
called y^e Mucosum, & that these contain a fluid
perfectly like to that w^ch in y^e elements or
Intestines, we can may y^e colour of Leaves
if we soak in water, y^e myselfe becomes yellow
if Milke they appear white, & if we add
Liquor y^e colour can be still more varied
but as for common they contain a mixture
of oil & water, y^e principles of which are
soon separated, y^e Liquor appears white or
opaque, & hence y^e myselfe have been named
Lacteal. Besides this proof of their origin
y^t we can at pleasure alter their appear-
ance, when we examine y^e Course of
their contents, we find that it is from y^e
Intestines towards y^e other parts, & we
cannot conceive y^e motion any by y^e stom-
gest pressure, for w^ch in these myselfe
more

there are flood gates or Vulves which in make an
insuperable resistance. After proceeding so far
if we were merely to speculate upon it, without
reading y. matter by experiments, we should
find ourselves at a loss to determine y. manner
in which y. lacteal vessels and y. chyle
might be supposed to pass from y. intestines
& so on (& in some few Animals there is
observed a distribution of y. kind, particu-
larly in a small worm, which is frequently
found in y. liver of sheep, & which feeds
upon bile, from y. mouth of y. Animal
there is an immediate dispersion of y. bile
to y. different parts.) But in man & in
other Animals, when we pursue y. lac-
teals vessels, we observe y. y. smaller
branches join into larger, & at length form
considerable trunks are formed, & there
is a communication from one branch
to another, y. vessels distant from it
but at length then and all collected toge.
into a trunk. In which progress
y. vessels are provided in y. flood gates

Upon this view of the Vessels before you, which are filled w.t Quick Silver, for there are no Injections made to confine the Mercury, I think it very evident they are all filled from the Vena Lacteal, & excepting the preparation even the Quick Silver does not fall back again, Nay upon taking a more distant view when filled w.t wax we can see the Lacteals. Still pursuing the Lacteals, we find that they all unite in the back part of the body, & from this place is a pipe is continued running upwards near to the spine, along the back part of the Thorax, & hence they name that the Thoracic duct & we find that this duct terminates in the meeting of two large veins, viz. where the vein of the neck, or Internal Jugular vein meets w.t the great vein of the arm named subclavian, from running under the other bone at the great distance from the heart, or at the ends where I pencil w.t my finger in the neck. Here we observe that the watery thing liquor, which Anatomists call Chyle is intimately blended w.t the mass of blood, thus we know that the Chyle or nutritious liquor must be continually passing into

into ye Constitution for ye support & nourishm.t 88
of all ye parts, we now perceive ye from the part
of ye body, there must be passages leading to
all ye.m, & we learn a 2.d fact ye y blood does
not stagnate in y vessels, but is in a continu.d
state of motion, & therefore after examining
ye nature of ye Circle & of y. blood, we would
proceed to consider ye manner & kind of
motion, & find it ye more necessary, before
going on to describe ye course of these liquors
in ye body, to give you some account of ye com-
position of ye blood, yt. these are commonly
met w.th in ye Systems of Anatomy, are not
merely erroneous, but have ye appearance
of being supported by very (decisive) arguments.

You all know ye general colour, &
our mass of blood, yt. it is red, & I take it
for granted that you have seen ye spontaneous
& separation of it into parts. Admitting there-
fore, we are all ready to imagine yt. ye several parts of ye
blood are essentially different from each
other in every quality, yet if you look
into Boerhaave, Haller, & Hewson &c.

you

you will find an opinion entertained by many
one part may be indeed converted into any
by a mere separation of parts, & by ground more
of this opinion is taken from observations
of Leuwenhoek, a Dutch Writer of last Century
who was a careful observator w.t by Microscope
He pretended that he discovered that the
parts, what we commonly call red globules
were composed of a number of smaller globules
& even pretended to define y.e number, y.t it
was 6, & y.t if in y.e course of y.e Circulation
or otherwise y.e Globule separated into its 6
parts, we formed of all y.e Serum, y.e colour
less part of y.e blood. he went a step further
alledging y.t y.e seven Globules are com-
posed in like manner of subordinate sym-
phatic globules, & so on for several Succ-
ceeding series. his observations were
readily received, from y.e accuracy he
had shewn in many other particulars
May several ingenious Physiologists wit
out appealing to experim.t, but considering
y.e most fit way of composing a tough
mixture out of smaller spheres as Dr Martin
found

found yt. ye parts make yt. most compleate figure. yt
Still further Credit is given to this opinion in
consequence of what has been observed by Dr
Haller & others, who say that they have seen
yt. separation of yt. red into colourless parts.
Perhaps wt. out further Circumstances yt. falla-
cy of yt. experiments of Leuwenhoeck, would
have been very early detected, but this opinion
seemed to correspond wt. several ags. Phaenom.
Boerhaave tells us yt. on exposing yt. blood
in a damp place, & wn yt. red colour disa-
appeared, & it was observed yt. yt. very thin
ges observed by Leuwenhoeck might be seen
daily. for if a purgative is given, a colourless
matter is evacuated in great quantity, & yt.
patient becomes pale, as if yt. red Globules
had been broken down, & discharged in their
broken state by yt. purgative, & an observation
is spoke of, & I do not find yt. yt.
appearance has been fully explained to ad-
in favours of yt. same opinion. viz. if by a
suitive, blood is extravasated under yt.
skin, you have all observed yt. in a
short time, yt. part becomes of a yellow
colour

colour, & at length ye whole matter yt was opt. 91
unvaled to ye eye in. Viz if ye lucabrung (down
of ye globules formed ye yellow & ye lucabrung
down of ye serum again gave such a tonicity
to ye fluid, as to enable ye Absorbents to re-
ceive ye whole. ( )

Now notwithstanding ye above appearances
& experiments in favour of this doctrine, I can
give a clear & full refutation of it. I have re-
peatedly examined ye Circulation in living
Animals, w^th out ever perceiving either an
appearance of smaller Globules forming ye
larger, or of a separation being made in
any shape of ye larger into smaller (& I
can only explain what Dr Haller said of
have related by supposing y^t ye strong
light have been thrown upon ye object. Viz if
you examine a small vessel conveying re
Globules w^th ye light of ye day, it appears
red & opaque, but when ye clear light of
ye sun is condensed by a speculum, it has
more ye appearance of being transparent
(I kept all the time the globules pure and mixed w^th ye Serum, y^t

we cannot discover y globules in y. serum blood
& if we mix y. globules just w.t water, or w.t
serum, agitating it in order to break it down
we cannot take away y. colour. May there has
been some unaccountable mistake in y. experi-
ments of Boerhaave & de Haen, in finding
y.t y. red colour of blood kept in a moist
place entirely disappears, for I have kept
it months in a warm place w.t out dilution
& w.t it; & found always y.t y. colour re-
mains, but y.t it grows darker like y. ground
of coffee. Neither can we by agitation form from
y. serum a single red globule, & what is an
argumentum crucis, when we mix y. red
globules w.t pure water & agitate y. mass
y. colour remains, but y. globules disappear
& hence we observe y.t y. colour & situation
of parts have no immediate connexion &
this observation explains to me many things
by which Authors have been misled. Since
we surely cannot suppose when a hunger-
ing is given, y.t it shall allow y. whole
mass of blood, we see a paleness produced
but surely we cannot suppose y.t this

(depends

depends upon ye evacuation of ye dissolved blood &
ye same appearance is produced by a sudden
passion of ye mind, as in fainting, which distri-
butes ye system, so y^t ye blood is not driven
into ye extreme vessels, & ye colour goes and
comes as ye circulation is more or less forcible
(where ye blood is extravasated, we explain ye
appearance from ye Globules going into interstitial
parts, & being reabsorbed tho' they retain
their colour, may ye red Globules more readily
enter ye absorbent vessels more readily than ye serum
itself does, & hence ye redness disappears
whilst ye yellowness remains, & I have observed
20, or 30, or more times ye ye red parts
of ye blood are actually received by ye absorbent
lymphatic vessels, y^t not only where there
is an extravasation, but where from irritating a part we produce Inflammation
upon examining ye contents of ye thoracic
duct, wherever ye Inflammation is situ-
ated, we find y^t ye red particles have been
received into ye lymphatic system, & so
far I used to alledge many years ago
but till of late years that we more readily

obtain

able to shew a fallacy in y^e^ most common System 44
yet we find some difficulty in substituting a bet-
ter in its place, & we are chiefly indebted to Sanac
for pointing out y^e^ way in y^e^ 1749, since y^e^
wch great improvements have been made with
respect to this subject by a number of ingen-
ious Authors, particularly by y^e^ Abbe Nollet & by
y^e^ late Mr Hamen who has received Nollets
experiments w^th^ very considerable additions

To we are to explain y^e^ principles of
y^e^ blood in y^e^ following manner, we are to con-
ceive it to consist of two different parts
or principles, it consists of such parts y^t^ we
can shew to y^e^ eye, & w^ch^ these there is en-
tangled a quantity of air, which is very rea-
dily disengaged from y^e^ blood, & in proof
of this my Father long ago made y^e^ fol-
lowing experiment. He bled up y^e^ Carotid
artery of a living Animal in two places
& then cut out y^e^ piece, he next threw y^e^
artery w^th^ y^e^ blood into a vessel of water
from which y^e^ air had been purged as ex-
tracted, & y^e^ artery being heavier than
y^e^ water sunk to y^e^ bottom, he then put
it

( )

it under ye exhausted receiver of an air pump &c 76
take off ye pressure from ye surface of ye water
in consequence of this ye artery rose from
ye bottom, i.e. by removing ye pressure of
ye external air, ye air in ye blood had separa-
ted from it, enlarged ye coats of ye artery,
rendered ye whole specifically lighter than
water. The other parts are

1. An aqueous liquor, wch aquablity of
salt of a particular kind dissolved in it;
which gives ye blood a saltish taste & thus
senses calls properly ye serosity, we may
compare it to ye urine of Animals, which
it resembles very much. 2do. The redcolour-
ed part, which in composed of particles
which for want of a better name we comm-
only call Globules. Till lately they were
generally, tho' not universally supposed
to be perfectly spherical, & ye first person
who by clear experiments pointed out ye
contrary was ye Abbe Fontana, he found
that ye red parts are flat, but he supp-
posed yt in ye middle there was a hole
or perforation. But Dr. Young & Mr
Hewson,

Mr Howson have corrected that mistake. In them of no manner of doubt but yt. yt. middle is like wise filled up. Mr Howson has compar ed yt. red part to Shillings. Now they differ very materially from these, & it is difficult to describe them. Nay there are some circumstances in yt. shape, yt. are not yet sufficiently attended to. I cannot yet satisfied about yt. form. They appear to resemble a Magnifying Glass not in a ring, or comparing yt. thickness wt. yt. breadth. They resemble a Thin Sieve rather than a piece of money, & yt. middle part seems to have properties different from yt. edges. When they are examined wt a faint light yt. middle appears darker, if wt a strong light it collects yt. rays nearly as a lens would do, & appears particularly bright The shape in my remarks to be explained from any idea of an oily nature, or of a repulsion which yt. blood may be supposed to have, & which in reality yt. serum has to yt. red part. We are yet very far from being able to comprehend yt. manner in which yt. red parts acquire yt. particular figure

seguine. The red part is ye heaviest of ye mass of
ye inflamed part of ye clot being of ye deepest
colour, or when we mix ye red part w^t water
it falls to ye bottom, & ye cause is ye same if
we mix it w^t urine.

And you have observed in ye Inflam.
matory diseases, ye surface of ye blood, that
crusts so becomes very tough, as when it is
said to be sizy, or to have a Buffy coat. This
may serve to give ye idea of ye coagulation
of ye blood may depend upon a different princi-
ple from ye red part, & yt ye red is not
ye coagulable part of ye blood, or if we take
it for granted that ye sizy or inflamed part
we will readily suppose that ye coagulation
may depend upon it, or we may denominate
ye thin part which have been called ye
coagulable lymph, ye coagulating part
of ye blood (have called it pure from
ye lymphatic vessels) got a column of water,
which coagulated into a clot, or if
you take a clot of blood divide it into
slices, wash it w^t water, & take out ye
ye colour, ye coagulable lymph remains

and

(w, if we let y. blood run into water, y. grumes & y. coagulum is found on y. sticks. So y. clotting depends upon this pulsation, & it is owing in a great measure to y. exposure to y. air, which has an effect in coagulating it in a very remarkable degree. But I have observed y. on tying a vein of a living animal in two places, & cutting out y. piece & hanging it perpendicular & close, the access of y. air is not necessary to y. coagulation, but it exhibits it greatly. I have tied out of y. jugular vein a quantity of y. chyle that was effused into y. cavity of y. pleura, & that it was 24 hours after before y. animal died, yet upon opening y. thorax y. chyle remained fluid, but upon being exposed to y. air it coagulated in a few minutes, so y. air contributes very much to y. coagulation.

Next you all know, y. white we commonly call y. serum of y. blood when exposed to a boiling heat, or ripped out evidently spirits coagulates, hence it has been thought, y. y. serum contains

merely

mercy of ye Serum of those wt. ye coagulable lymph. But that ye matter of can be coagulated in ye Serum very much resembles ye coagulable lymph it is doubtful if we are to consider it as absolutely ye same. For that we can prevent ye spontaneous Coagulation of ye lymph by mixing wt it a saline liquor resembling ye serum, yet from Mr Hewsons experiments, it is plain yt ye lymph can be coagulated by a smaller degree of heat than ye serum, & after we have inspissated ye serum, we can melt it down again wt water, which we cannot do to ye coagulable lymph.

Upon what I have mentioned, you will readily understand ye appearances we are produced, when blood is let out of ye body into a vessel, as soon as it is out, & is at ye same time exposed to ye air, ye Lymph spontaneously begins to coagulate, while in ye mean time ye red globules by their greater weight are falling to ye bottom of ye vessel, but slowly so hence they are generally entangled wt ye lymph, & some are not, but in which

it

it is very evident there is more lymph upon ye surface & more globules at ye bottom in consequence of their greater weight & hence ye bottom is of a deeper colour independent of ye effect of ye air, which has increased ye redness of ye blood, but even where it is not exposed ye undermost part is constantly ye darkest Again you remember ye power of ye air in coagulating ye lymph in consequence of which ye coagulation begins at ye surface & as ye uppermost part draws ye under towards it, where a tuffy coat is formed, ye uppermost part is ye thinnest & it is wash'd as you go (downwards) in ye mean time by ye coagulation of ye lymph ye lamps and globules are collected, whilst ye serosity is carried out, carrying along with it, what of ye lymph it is able to dissolve, or we may consume blood, if it is dashed to a process for clarifying sugar from any faculent parts, like ye white of an egg, & by agitation mix it with ye whole mass, then exposing it to a boiling heat, ye white of ye egg curdles &

& collects y^e^ flocculencies, which y^e^ water
cannot dissolve separated & producing an appearance like to y^e^ skeleton of y^e^ blood.

When you treate y^e^ consistent parts of y^e^ blood, you can form no idea of their use in life. The vessels give fluidity to y^e^ whole & preserve y^e^ figure of y^e^ Globules from a total dissolution, which is between these two parts, for as y^e^ serosity readily imbibes, while in y^e^ vessels y^e^ globules preserve their shape much longer.

As y^e^ Lymphatic part gives a Body to y^e^ whole mass, & perhaps vibration by being interspersed, it more accurately divides y^e^ respective globules, & prevents their immediate union, as by y^e^ mixture of Gum water we separate all the globules to a red fluid, the lymph also prevents y^e^ coagulation of y^e^ serosity into y^e^ several cavities of y^e^ body, as happens in y^e^ case of Dropsy, & on many occasions it is imposed by means of an epithalium between y^e^ different parts of y^e^ body for y^e^ ready motion of one organ upon another

in that. Whilst ye red globules pass unmolested
to ye blood, & ye difficulty in what they pass
thro ye extreme red vessels, may be a cause of
ye momentum of them; may be ye cause of
Fibre, ye nature & action of which, we do not
yet perceive.

Hence we understand several of
ye changes which take place in ye bodies of
Animals both before & after death. We have
observed yt in ye spontaneous separation of ye
latten place wt out ye access of ye air, & we
you understand yt whenever a large part
of ye blood is out of ye vessels & stagnates
or coagulates, it must be disposed to corrupt
fate. We have a proof of this in both kinds
of Aneurisms, ye bud & ye false, where one
layer of ye coagulum is gradually added
to another, & nature makes ye feeble effort
of continuing life by closing up ye door
and away in this manner. Nay we
find from muscles in ye Uterus or false
conceptions, which may contain ye rudiments of a Fœtus covered wt ye coagu-
lable part of ye blood. And from these
facts

facto, we must allow, that in certain cases
passive may form wt in ye heart, & be ye
cause of much disorder, that ye diseases
assigned to this cause generally depend upon
some other. We may conceive yt in certain
occasions ye parts of ye blood may run toge
in fainting fits, & yt upon ye body being
restored to its vigour, ye action of ye heart
may undo ye clot yt is beginning to form
but if ye person continues long in this
languid state, & ye powers of life are not
sufficient to separate ye parts, ye grume
wants of a Polypus may be laid again it
any part be wounded, tho many vessels
are divided, all but ye largest close of
themselves, besides ye contraction of ye
vessels, a coagulation is produced by
ye exposure to ye air, which plugs up ye
mouths of ye vessels. And lastly we can
explain ye appearance of inky blood, or
of ye buff coat; it is only supposing ye
ye blood is less dispersed than usual to
run together, so more time given to ye
red globules to fall to ye bottom, in con-
sequence

equence of which no part of it must be thrust out
upon the surface, that from the difference
in the colour, there be reason to suspect
in some cases a morbid alteration may have
taken place.

Sect: 5th.

Hauhael, meeting, began to give some
explanation of the structure & economy of the
Body. After endeavouring to distinguish
animal from the Vegetable Kingdom (about
which of necessity at present, & mentioned
the means by which an animal is enabled to
attain it) with the various changes of aliment
must be supposed to undergo, before it can
with safety & advantage be received into the
constitution.

We then found that the nourishment
is drawn in, in the way Vegetables take up
their nourishment by the mouths of the roots
which from the colour of their contents have
been named Lacteals, that they join together
to form one duct, or tube, called the Thoracic
duct, which terminates in a large vein
near to the heart, or the part of nourishment
is

is intimately blended w^th y^e other, & hence we
are debarred from finding, (as we could together
to give such a notion of y^e properties & principles
of y^e mass of blood,) so essential to the measures
in y^e Physiology & y^e Practice.

We know y^t every y^e most minute
part of y^e body is undergoing a perpetual change
& waste, & therefore needs a constant supply;
we are led to perceive y^t from y^e Arteries
y^e Vascular (and terminated thereby) be
passages leading to every part, we observe
therefore further y^t y^e mass of blood cannot
be in a stagnating state, but y^t it possesses
a continual motion, & we are therefore led
to trace y^e progress of y^e blood in y^e body
& to examine y^e causes on which y^e motion
depends.

When by Dissection, we pay in view
y^e Veins & y^e termination of y^e Vascular
(duct), we are apt merely from viewing
them to be led into erroneous opinion, as
y^e ancients formerly were. From we see
from this place, branches of veins can be
traced to all parts, so we might be ready
to

to imagine that ye blood might from thence have
to all these But upon examining ye aforemention
ye Valves of ye veins, we find within them certain
thin membranes which perform ye office of
valves or flood gates readily determining
ye motion of ye blood towards ye heart, but
hindering it from moving in ye contrary
direction. We may compare these valves
to a door w^ch has two leaves, y^t open when you
push it in one direction, but shut when
you push it in ye other. By this observation
we may join what you'll have had occasion
to observe, y^t when a Surgeon about to open
a Vein, throws a ligature about ye arm y^t
being done will beyond ye ligature (from whence
which you will be clearly convinced y^t ye
blood moves from ye heart to all ye extremities
parts of ye body. So by means of ye Valves from
ye thoracic duct to ye termination, w^ch find
w^t it moves communicates into ye heart

Let us next observe ye nature
of ye heart, it is evidently a muscular
or fleshy organ, & capable of contraction
that ye general shape of it, may be
understood

mucrobed, I shew you it filled w.t wat, & then
y.e blood cried. Mefind seined w.t it large vein
called y.e Vena cava, & by distinguish it from
another vein by which y.e blood accends from
y.e inferior parts of y.e body, it is called Vena
cava superior. Where y.e two venae cavae meet
together, there is a large cavity, which stands
out from y.e heart, especially at y.e part
as y.e external ear of an Animal does from
its head, hence named y.e ear or Auricle
Under y.e Auricle you discover another very
large cavity, which is named y.e belly, ventricle
or Ventricle of y.e heart, & you in these cavities
y.e blood is squeezed out & filled in a blader or
would be by grasping it w.t y.e hand. Let
us then see in what direction y.e motion
of y.e blood is necessarily determined. The
valves in y.e veins prevent y.e blood from
passing backwards, therefore when y.e
auricle squeezes y.e blood it passes downwards into y.e ventricle. But when y.e
Ventricle draws itself together, where
does y.e blood go to? you now observe y.t
it can't return into y.e auricle, for your
hand

find y^t there is a membrane placed arround y^e mouth of y^e ventricle in a valve from its shape called Valvula Tricuspis, which prevents y^e return of y^e blood. We look for an outlet from y^e Ventricle & accordingly we find one large enough to admitt a persons thumb that passage leads to a round oblong hollow shaped vessel, to which y^e name Aorta has been given, but very improperly, for it is bereaved from y^e erroneous opinion of y^e antients y^t such vessels contained air

It might be expected y^t this valve should be divided minutely, & dispersed over y^e whole substance of y^e body, & in fact in some few Animals, as in y^e Frog, it does so, but in y^e human body & in y^e Animals resembling Man in y^e Quadrupeds & Birds, we find y^t y^e whole is entirely spent upon y^e lungs & you observe y^t it is divided into two nearly equal Branches, one of which goes to each side of y^e organ, & when we proceed to trace it farther, we find that it plunges into y^e lungs &

which. Still however we must continue to trace the progress of the aqueous humour in other parts of the body, as we have not found any other passage for it. We therefore attempt to furnish it further by dissection perhaps but we ever find the branches become connivent so altogether to escape us, that they become invisible. We must therefore have recourse to some other expedient, in order inquiring into the nature, & observing what becomes of it as it flows, in a milky liquor, we observe that the colour is communicated to the whole surface of the lungs, & returns back again to the heart, as from the arteries it enters corresponding veins called Pulmonary. Following therefore, instead of finding them divided into minute branches, & that they lead to an organ of small body, we find that they unite as join together, & discharge the blood into a vessel similar to that already shown, viz. an Artery, so to distinguish the two, Anatomists from observing the situation of the heart in the Quadruped, have named the first, as lying

[illegible] ye right [illegible] ye right auricle
[illegible] ye other from wence [illegible]
[illegible] left auricle, that in ye human body ye right
is more properly name anterior & ye left ye
posterior Auricle, but I shall keep to ye com-
mon name of right & left. Now I find that a
new impulse was needed to drive ye blood
wt sufficient force to all ye parts of ye body
& now we reflect ye structure we have seen
upon ye right side, as we observed ye under
ye left auricle there is a conduct ye left,
& from this we observe a passage leading out-
wards, an artery taking its rise, which
is named by Anatomists ye aorta, & you ob-
serve yt ye two sides of ye heart have no
immediate communication, but are filled
wt materials of a different colour. And as a
further proof that ye blood really takes
this course, we next observe yt ye blood
when it has got into ye lungs by ye pulmo-
nary artery cannot return back again for
we find at ye mouth of this artery three
membranes, which are so disposed, as to
have ye effect of shutting it, when they are
pressed

instead inward they resemble a half moon or
semilunares but y mouth of y valve
there is exactly of very same structure
with those membranes which meet together
& shut y mouth of y artery w! y utmost
accuracy.

We have found then y blood passing
out of y heart into y aorta, by means of
which it is dispersed to all y other organs
of y body, now observe y! y aorta naturally
turns outwards and arches & from y top of y arch
branches out to y head & arms, while y
principal trunk runs downwards supplying
y Thorax, Abdomen & lower extremities &
y aorta we pursue y branches as mentioned
to be necessary in y lungs by dissection but
in this way we can only go a certain length
for y Branches are soon so minutely divided
y! they escape us. But by making an injec-
tion as before w! a coloured liquor, we
find y! it passes from y aorta into y veins
cava, & y! it goes back into y veins w!
y examination of which we set out
But, as we are in danger of tiring
our-

anatomy in order a field for us all
we to open parts of y. system; & first I shall
show you y. y. arteries divide into so many
parts & y. these make such a bustle y. y. y.
arteries alone are filled, y. shape of y. part is
in a great measure preserved, so in y. kidney
to complete our notion of y. structure, let us
take one of y. membraneous bowels, so I show
you here y. membrane by which y. Intestinal
canal is tied to y. root of y. body, y. w^ch
is named from its situation in y. middle of
y. Intestine, Mesentery, when we follow y.
Mesenteric vessel, you perceive y. mesentery
running directly to y. Intestines, it dividing
a number of circles & neighbouring branches
communicate w^th each other, forming what
is therefore called Anastomosis, we di-
vide y. same thing continued in y. still
smaller branches & y. branches of y. artery
when joined together are larger than y.
trunk which forms them, & you see a vast
number of small branches produced, which
exceed very much in size y. t. of y. artery
when y. Intestines after injection are
still

still open & dried, you see ye exceeding minute
branches, where ye Injection is pushed & may
may be communicated & coloured to ye innermost
coat of ye Intestines, & w^th a Glasse we can see
an infinite number of very minute branches
which in a great measure escape ye observa-
tion of ye naked eye, & from ye Inter-
sections which we are obliged to employ in
ye Circulation, It is very evident yt they must
escape ye eye entirely, for it is very certain
yt ye whole 2 or 3^d of those branches con-
veying ye red part of ye blood in ye extremi-
ties of ye arteries cannot equal in size a single
hair of ye head, I therefore repeat ye words
I mentioned in speaking of ye Pulmonic ar-
tery, yt ye blood passes from ye extremity
of ye aorta into ye beginning of ye vena cava
To shew you an Injection made from ye tem-
poral artery into ye temporal vein, & to
shew you ye veins of ye hand filled by
pouring Mercury into ye artery, imitating
ye Circulation. Next you find that this
motion of ye blood in a circle is constant
& rapid. The ye heart is in continual play
employing

emptying itself at each stroke of y. Ventricl.
so yt. if you enter into calculation, a prodigious
quantity of blood is thrown out from y. heart
in a very short space of time. 2ly. Tho' when
an artery or vein is wounded, a equal quan-
tity of blood is discharged, nay an Animal
may be killed by opening a small branch
of either System. And imitating an experiment
made by Power, we can give another proof of
y. same thing. We transfuse y. blood from
y. artery of one Animal into y. vein of another
whereby y. first was drained of its blood, while y.
latter was overcharged, & by applying y. hair-vessels
we perceive it passing in a rapid stream from
y. extremities of y. arteries into y. beginnings
of y. veins.

Tho' when we attend more particularly
to y. course of y. blood in y. human body, we
perceive yt. it moves twice to & twice from
y. heart, before y. full & entire circle is com-
pleted, or that there is a necessity or use
for y. whole mass passing thro' y. lungs; (at
present it would be improper to dwell
upon this, only it is certain that we are

constantly

a manifest proof that the air we expire upon
venous matter, so if I breathe for a short time into
a small vessel, & then put a small Animal into
it, it is killed, & I shall show afterwards that
we derive from the air a something necessary
to life.) So y^e blood after going to y^e heart thro
y^e lungs, & coming out to y^e lungs, returns
to y^e heart again, & we find y^t a new impulse
is necessary in order to continue the motion
the force with which y^e chyle is moved in y^e
Thoracic Duct is not sufficient to convey it
to y^e lungs w^t out y^e impulse of y^e heart. So
far less can y^e blood be diffused to y^e rest
of y^e System w^t out a new impulse. So if
you mean by a heart an Organ y^t can
give impulse, such an organ is manifestly
necessary to restore y^e force w^t which y^e
blood Circulates, for if you fix a tube into
y^e Carotid artery of an Animal as y^e horse
y^e blood ascends to y^e height of about 10 feet
but on making y^e same experiment on
y^e corresponding vein, it only rises one
foot, so y^t y^e rest of y^e force is lost, &
therefore a new impulse is needed. In

you

y^e know that our heart is double y^t we have two hearts, one for circulating y^e blood thro' y^e lungs, & another for circulating it thro' y^e rest of y^e body.

Let us now attend to y^e office of each part. we find y^t material enough is prepared to compleat each Cavity, a vein & artery, an auricle & Ventricle. The office of y^e vein, of y^e ventricle, & of y^e artery is very evident. The vein conveys y^e Chyle, & y^e blood towards y^e heart y^e artery carries y^e blood from it while y^e Ventricle gives y^e necessary impulse to force y^e mass out, & renders our body an Automaton, something beyond what we can imitate in Machinery. But it remains y^t y^e office of y^e Auricle be determined, & that is by no means so evident.

But let us suppose it wanting, what if y^e Ventricle & not an auricle is in action what must have become of y^e blood in y^e veins? it must have been accumulated in them, whereby they must have been under an unequal state of dilatation, & when y^e Ventricle had ceased

cannot acting. Now were it to be wholly emptied for again to supply ye necessary powers of life, as it serves as a receptacle of ye blood receiving it from ye veins, whilst ye ventricle is in action (when ye ventricle has ceased from action, it is ready to fill it again quickly enough & in consequence of this to give it that Stimulus or irritation which is essential to ye renewal of ye action, for ye more suddenly it is filled, ye more it is solicited to react, & give ye impetus into ye force to ye blood thrown by it into ye arteries

When ye uses of ye several parts are known we can determine ye times at which ye several parts cooperate, some of them are synchronous, act & are relaxed at ye same instant & yt in ye following order. No matter what supposition we adopt whether we with Dr Hales suppose ye Chyle into ye heart (one of ye actions of Chyle must be to excite in every part of ye animal oeconomy all ye faculties fully at ye same time instant. Let us make ye first supposition yt ye Chyle gradually powers in comes at length to fill ye auricles

When this is full & in danger of being forced

d

it contracts, ye Valves prevent it from throwing
ye Chyle back into ye Thoracic Duct, so it is thrown
into ye Ventricle, which receives it as ye food
mouth. Next ye Ventricle is brought into action
& whilst it violently acts, it throws ye blood into
ye artery. In ye mean time more Chyle or blood
is coming into ye auricle, so yt it is again
filled, as we observe yt ye auricle & ye artery
are filling at ye same time, ye artery from ye
ventricle, & ye auricle from ye veins. As soon
as ye Ventricle again ceases from acting, ye
auricle empties itself into ye Ventricle, whilst
ye artery is pushing forwards ye contents into
ye veins, so ye auricle & artery are synchronous
whilst ye ventricle is in action they are filling
& whilst they are in action ye ventricle is
filling. & if you understand ye manner
in which one side of ye heart acts, you un-
derstand both. As let us suppose yt all
parts are moderately filled w^th blood, yt
they are all distended & endeavouring to
contract. As ye Ventricle is strongest in
contraction (for it's fibres placed, &c) as
ye two Ventricles receive blood from each

their, & their common septum they must act
at ye same time. By their acting ye arteries
are further dilated, while at ye same time
ye auricles are filling. & upon their ceasing to
act, ye auricles which were before filled
& ye arteries which were stretched emptily themselves
so, & in every succession ye auricles & arteries
correspond.

Now after knowing ye general structure, & ye times of action, we see why ye arteries
possess a pulsation, & why ye veins want it. The
blood is thrown into ye arteries suddenly, & the
ye whole arteries make a larger tube than ye
aorta, ye branches being when taken together
much wider than ye trunk, yet from ye resistance of ye sides of ye arteries, of ye angles which
they form, & ye minuter mass of blood which
is to be put in motion, as well as ye quick
action of ye heart, ye trunks of ye arteries
receive a quantity of blood greater than they
contained before, in consequence of which they
swell out, & are made to change their place
& hence ye finger receives a stroke from
them. In ye veins again ye blood moves
as

in in an almost uniform stream, for if the flow of the heart is invariably less before the blood reaches the extremities of the arteries, when it is commu-nicated to a large mass, & divaricate altogether in the beginning of the veins, just as when we draw blood into a syringe by alternate pulses of a syringe, it runs out from the orifice like in an uninterrupted stream for the auricle of the farther end, near to the heart is ready to re-ceive the blood, whilst the ventricle is in action there is no alternate stop put to the return of the blood in the veins, we get it moves on in an almost uniform manner.

With regard to the cause of this regular action, the distension of the parts will be the im-mediate cause, but it would be improper to enter upon the full consideration of this subject here. Nor can we to consider the various uses of the circu-lation fully in this place.

You recollect what Dr Hamilton explained of the nature of the blood, that it is disposed to coagulate from a want of motion, & the vi-brations hinders the from coagulating. And the general mass is no doubt exposed to the same

fraction

ſection; & it is neceſsary yt yd Ruluencent parts
should haue an outlet, which is giuen to them
by yd motion communicated to yd blood, which
preſents it to yd vena ua outlets of yd body, just
as yd motion of yd Ocean by yd tides giues vent
to yd discharge of yd Sulueacent parts. you vnder-
stand yd effect yd circulation must haue
upon yd aliment, by certain precesſes, it undergoes
changes before it enters yd sanguiferous, &
these changes are continued by yd repeated cir-
culations, whereby it is conuerted into blood;
. Now you conceiue yd independent of sulueſ-
tion, certain parts must be allowed from yd
solids of yd body, by yd operations of yd heart &
action of yd muscles, which need an outlet, &
by yd mass being reſerued to yd excretory organs
yd discharge is more readily made. & thus
you may imagine yt as yd general circulation
is capable of conuerting yd nourishment into
blood, by certain organs of yd body, still for
their changes may be operated, yd whole ani-
mal kingdom receiues within it yd aer
& it is lodged in yd stomach a certain time
before it can wt safety be applied to yd body

& it presently is mixed w^th y^e whole mass of blood & remains
by y^e other liquors. & by y^e circulation y^e necessary 6
separation of blood liquors is promoted. 7 By y^e
circulation the y^e fibres is repeatedly brot to every 7
part of y^e body to supply y^e constant waste, which
must soon be immediately done by y^e arteries
y^t have & not y^e nerves now for this purpose
And we may imagine y^t a sort of substance
passing to y^e solid, as well as to y^e fluid 8
parts, by y^e operation of y^e heart & muscles, as
also in wounds, wch new vessels need to be
produced & also of substance to be repaired
which w^ch many oth^r operations in y^e Oeconomy
may are evidently connected w^th y^e circulation

Lect. 6^th

At our meeting yesterday I endeavoured to
explain y^e circulation of y^e blood. I spoke as
I purpose in y^e most general terms of y^e exa-
mination of y^e arteries. But if you now recal
to mind what was mentioned of y^e principles of
y^e blood, as its division into a red & colourless
part, & compare w^th this y^e appearance of y^e
body even upon its surface, where you find
a variety of colour in y^e skin for instance,

in

in y. white of y. Eye, in y. chearful y. if you
surely must conclude y. besides y. arteries which
convey y. red parts, & which forward y. same
proper name, we call y. red Globules there must
be others which (admitt only y. serum) y. tympath
of y. blood, may perhaps y. water only, as y.
there are descending veins & arteries, such as
we ought to name lymphatic, serous, aqueous. &
you will be y. more convinced of this, when upon
dissecting y. body you shall find a still greater
variety of colour & texture, if y. pain may be
hung together, suppose y. upper end y. concave
of an artery w. its correspondent, viz y. thumb
may be supposed to resemble a red artery, and
y. other fingers represent y. descending veins.

Next you surely must imagine, y.
there are other besides y. circulating extremi-
ties of y. arteries, you surely suppose that
there must be arteries, y. separate from y.
circulating, mass certain heads or y. which
do not return their liquor to y. heart again
For w.t end this how can our mouth, or y.
eye be moistened? or how can y. veins &
glands play upon each other, or y. heart

but

but by y. subjoined n. 5 all y. parts have
taking their rise in branches of y. arteries m.
. Indeed in general name occurring which
separate or recal certain portions. Thus if
I again join my hands, to represent y. circula
ting vessels, suppose y. thumb, & 2 of y. fin
gers to represent y. circulating extremities,
y. little finger may be supposed to represent
a occurring vessel, pouring a fluid into a cav
ity, suppose y. cavity of our joints, & in
proportion to y. accretion made it is evident
that there must be an absorption occurring
ing, for without this one of two things
must happen, y. y. several cavities w.
become dropsical, y. liquors coming at last
to distend them, or suppose an equivalent
quantity deposited, y. by stagnating
would corrupt & erode y. several parts
It remains therefore y. we endeavour to
determine y. manner in which y. inhibiting
System begins, or how y. absorption is
performed.

But here I must crave to you a new
fact, you would conclude y. y. absorbing
vessels

for y^e first rise in y^e inosculated fluids
must demand in them as y^e they must be
known, you can't imagine a more just proportion
absorption to terminate in an artery, at least
not so readily. For y^e force w^th which y^e fluids
are driven in y^e arteries is very considerable
whereas in y^e veins, y^e force or momentum
is much diminished, & y^e fluids they convey
are readily again returned to y^e heart. The
fact necessary now to be explained to y^e
reader is y^e many known to you all, which run
many of them under y^e skin, upon their
first rise, & contain y^e red blood, there are every
where, in all parts of y^e body, another sort
of veins, to which Authors have given y^e name
of Vasa Lymphatica on account of y^e
great number of valves or floodgates, w^th
which they are crowded in their course, &
from their contents appearing colourless
like to y^e lymph of y^e blood. They appear
jointed, & at every joint there is a pair of
valves, I shew you them in y^e human
tremity running upwards from y^e foot
along y^e leg, & thigh entering y^e body at y^e
top

top of y^e thigh, & running upwards till they join
y^e Iliacal nearest to y^e Thoracic duct

Now whether are we to suppose y^t y^e
absorbed fluids are taken in by small capillary
branches of y^e red veins, or are we to imagine
y^t this office is performed by y^e lymphatics? or
in what manner are we to force fluids from
y^e trunk of an artery back again to y^e heart?
If you look into y^e Systematic writers you will
find their notion to be this. they suppose y^t
from y^e arteries are sent off accompanying branches
as well as circulating & y^t y^e circulating branches
also their ephemeris divide into coloured &
colourless branches, or that there are veins
lymphatic arteries, which are so small to admit
y^e two globules, given y^e account mentioned
to y^e eye. Now when we apply y^e Microscope
to y^e pellucid part of an Animal, we discover
chiefly the red ephemeris of y^e arteries, but
we see none of y^e other branches, they escape
our sight by y^e smallness, not by their pellucid
clearness & y^e homogeneous texture, & yet are
as y^e fluids they contain

Do if you suppose y^t absolute vessels
[illegible]

as ye thin vessel of wch it must consist you cannot determine whether it make it red or no nation. And from ye opposition of colours shall be red wounds whose clear view of ye eye, yet the quantity & movement proceed in ye same proportion as to ye of ye vessel of ye body, we know yt such effects appear in like manner in ye particles, meant discovered, red effects. Now so far we conclude certainty wt respect to ye division of ye arteries, some indeed of late years, misled of supposing distinct branches, have imagined yt there was only an expansion from mechanic forces. (But you may take it for granted here, yt ye artery divides into coloured & colourless branches, & yt it likewise performs a secretion, Now in ye common opinion of Authors, these are carried on to ye heart in this manner, ye red branches of ye artery are supposed to form ye red veins, & ye colourless branches of veins & lymphatic circulating branches to form when united ye circulating lymphatic veins, which ye above diagram

are

a magnitude to be reckoned in my branches of y.
red veins, such as are described in y. arteries
under y. name of y. exhalant branches
seems they suppose y. there are correspondent
inhalant branches, which by open mouths
take in y. colourless fluids, mix them w.th
y. colour, & y. they both return together
to y. heart, whilst y. colourless circulating
parts return to y. heart by y. valvular
lymphatic vessels.

Certainly, if I had not begun with
an explanation of y. common opinion, you
might have made a better guess to y. truth,
than this will be found to be. For, tho' you
had admitted y. y. red branches joining
together form y. red veins, & y. colourless
circulating branches y. lymphatic
& considering y. course of y. absorbed
fluids, you would more readily have
imagined y. they terminated in y. colour-
less veins than in y. red, or you would
have supposed y. y. lymphatic vessels
were intended not only to circulating
beginnings, but to branches performing
absorption

absorption. Will however that their supposition 124
might have reason were nearly, it might
not have reason to us, but we might have
supposed y^t initial y^e one ml of animo, y^t red
persons y^e circulation, y^t other mediate
persons y^e absorption, y^t y^e branches of y^e
artery y^t persons circulation, whether red
or colourless, formed & coloured ye beginning
of a corresponding, red vein, whilst y^t lym-
phatic vessels are uncoloured w^t either y^e
solution or veins, but begin by open mouths
every where, & shall afterwards prove that
this in fact takes place from a variety of
experiments & observations 1 from attending
to y^e analogy which y^e lymphatic vessels
have w^t y^e lacteal, which you know
begin w^t open mouths from y^e cavity of
y^e Alimentary canal 2 from attending
to their structure 3 y^e number of valves
w^t which they are every where provided
& more y^e valves are wanting in a great
measure in y^e accompanying red veins
or from their appearance in
4 an inflammation & their appearance in
5 turning [illegible] y^t they continue to

be

to Lillie after ye Circulation of ye Blood was ascer-
ned, or from viewing their colour, & observing
y^t their contents corresponde w^th those y^t are
ephaundated, or vacuoled from ye arteries y^e
effect of Poysons & of medicines, & more
especially from experiments which I have
made on purpose. you will therefore at
present rather take it for granted than be
fully satisfied w^th ye proofs y^t which I
can here perform ye Circulation, ye Lymphæ
duct here perform ye absorption, or ye veins
arteries terminales in red & colourless vessels
ches, we comprehending reduces are
composed of these, whilst in ye other Syste-
tem ye fluids move on, or in ye tactual
vessels, w^tout ye impulse a tergo.

Having now seen ye ye arteries
bordes circulating have becoming trans-
ches vent off from them, we return to ye
more particular consideration of these
First we imagine y^t in many different
organs of ye body little more than a di-
vision of certain parts of ye blood from
others may be necessary, & this separation

are

we suppose made by what are called exhalant
arteries, in which generally speaking, but
not without exception, considerable changes
are not made upon the mass of blood. But
when we reflect we are led further to see
that in many cases a very considerable change
of the principles of the blood must be necessary
We surely do not find in the general mass
which I have described to you a substance
corresponding to the Gall, nor can we easily
from any of the known general principles
have an idea of the effect of the semen in the
generation of Animals.

We are surely disposed to imagine, what
shall afterwards prove that the term employed
for expressing this division made by the ar-
tery viz. of secerning vessel, is only equi-
valent to that of a letter, & that a circulation
is produced. But to shew the fallibility of this still further we surely ad-
mit that the alimentary we take in is by the
repeated circulation, or by a certain process
in passing thro' the general System con-
veyed into the blood, & from this consider-
ation

lain you will easily see that y^e next way
by certain organs of y^e body may have further
changes operated upon it. Hence a complex
structure comes to be necessary, or we find
large masses which, Anatomists call glands
from their resembling an Acorn, in which
certain liquors are prepared & separated
we see another necessary circumstance, y^t
great quantities of y^e same kind of liquor must
be needed in one particular organ of y^e body,
or it may be necessary y^t a considerable quan-
tity should be deposited in a certain part of
y^e body, as y^e urine into y^e urinary bason for y^e
y^e bile into y^e Alimentary canal for y^e
preparation of y^e Aliment, and on both acco-
unts, viz. y^e changes necessary to be made
& y^e quantity of liquor required for particu-
lars, we find a convolution of vessels or
a gland formed. I need not mention y^e diffe-
rent names y^t are applied to y^e Glands from
their shape, as conglobate, when they are
of a Globular shape, as those we find in
y^e course of y^e Lymphatic System, or those
called vasa Vasorum, of which we speak under
y^e

y. skin in y. part, whereas in other places, a number of small glands or particles are placed to supply a larger mass, when we apply y. term conglomerate. From y. Gland a tube is needed to convey y. liquor, & this is called y. excretory duct of y. gland, & in these ducts y. small branches are constantly joining, to form larger, as y. liquor flows as in a vein.

The general structure being now supposed understood, we would wish to form some notion of y. principal purposes, which y. glands in y. body may be supposed to serve. Supposing it will not be necessary to enter into this enquiry very particularly at present. The most general use of secretion y. occurs in y. enabling us to perform our several motions readily, by preventing y. dryness of y. several parts, as this liquor is known out to lubricate our organs. Next as y. fluids of y. body are in a continual state of change, not only y. waste but y. nutritious parts are carried off, as in quick by y. glands, as while in a more subtle manner y. urine is discharged from y. body, there is a continued (discharge

discharge from y^e inner surface of y^e tongue, y^e outer
surface of y^e chin? Dº when y^e resistance of y^e
preparation y^e food undergoes, by y^e impulse
of y^e Ayster, & of y^e Animal Thing, in y^e
y^t however favourably they are situated for imbi-
bing y^e aliment; they take it into receptacles, que
must imagine y^t by a Glandular process y^e
food comes to be better prepared, we find a certain
matter separated, which acts upon it as a men-
struum; whilst other fluids render it more
to be received, & by y^e gen^l secretion, y^e nutritious
is minutely applied to furnish y^e repair, or nutrition
is performed by a separation &c we shall after mention
fluid y^t by means of secretion, y^e species of
Animals is continued, & variety of circumst^s
render it probable, that we are far from having
certain fact, y^t by means of this process, y^e
communica^n is maintained between y^e living prin-
ciple of Animals & y^e body, whatever opinion
we may form upon this head, it is evid^t y^t an
acquaintance w^th this substance remains in
order to complete y^e notion we would form
of an Animal Body.

We shall find y^t y^e communica^n between y^e
mind

mind & body depends upon our particular Organ, & y^e
solution y^t proceeds from it, for y^t can never y^e
y^t spiritual principle of Animals, by w^ch we are
rendered sensible of impression, & enabled to per-
form motion is not universally diffused, for
if a leg or arm is amputated, that your wounded y^e
member, y^t person feels no pain, nor can he by
any exertion of his will produce y^t usuall effect
(deprived of motion). So y^t principle is communica-
ted from what Anatomists have very properly
called a Sensorium commune, a something that recei-
ving in, or connected w^th y^t Brain of y^t Animal.
Therefore I shall more particularly endeavour to point
out somewhat of y^e texture of y^t Brain, & of y^e
organs by means of w^ch we are enabled thus to
feel, you all know y^e general colour & y^e
appearance of y^t Brain. When we attentively con-
sider it to those, we find an inner portion of a
considerable size, which is separated by a deep
furrow from a small under portion. When an
Anatomist means therefore to describe this
part very accurately, he calls y^e upper y^t pro-
per cerebrum, & y^e under portion y^e cerebellum
When y^t Brain & cerebellum are both preserved
colour

certain cords of y^e same colour, that is proof of a very large cord which is inclosed by y^e several tunes of y^e Brain, therefore named medulla spinalis. Besides this we find a number of cords proceeding from y^e bones of y^e head, & from y^e medulla spinalis in every where which are y^e several nerves of y^e Body, If we take any of them into Examination it, we perceive y^t it is composed of fibres, laid parallel to each other, Whereupon y^e several nerves w^ch proceed from y^e end of y^e medulla spinalis, & w^ch Authors call y^e Cauda equina, because when they are split w^t a fine needle, they resemble y^e hairs w^ch come out of y^e tail of a horse. So y^e nerves are y^e continuation of y^e fibrous part of y^e brain, & of y^e cerebellum, & to w^ch Authors have given y^e name of medulla. When we trace y^e beginning of this part, we find it covered by a membrane of an ashy colour, & named therefore cinerititious, & even that there are certain membranes to w^ch very barbarous names have been applied, viz. of Pia & Dura mater, but y^e Dura mater is rather to be considered as serving to line y^e bone & to defend y^e brain

shall we making an external coat to the Brain in the
prosecute of nerves from the Brain, we perceive
the same Vascular membrane every where intimately
connected with them, when the nerve comes to pass out of the head, & to be dispersed
to more distant parts, it receives the further
addition of the membrane called the dura mater,
& hence it appears a firm substance. But you
are to imagine that the toughness depends chiefly
upon its outer coat, which is given it merely
as a protection, for when we trace it to the
place at which it performs its office, as in the
case of the optic nerve, it lays aside its hard
coat, & is soft & pulpy resembling the medulla
in part of the Brain from which it proceeds.
What serves sensation depend upon
the nerves, I shall show in the most decisive
manner, viz. by cutting any nerve in the
course, as in the hind leg of a frog, instantly
the part beneath loses feeling, we may after-
wards cut, may burn the ends of the animal
without its making any struggle to escape
by moving the rest of the body, & the same
mind we deprive it of the motion of the
tho'

that ye circulation continues motion & proceeds for a long time thereafter. I have kept proving it this condition for upwards of 17 months, during all which time ye immediate cause & manner of motion continued, ye vessels & motion and ye sole effects which they in a previous manner are intended to perform. For I shall prove yt ye nourishment is applied by ye arteries of ye Animal & met by ye nerves.

When you now review ye structure you have seen, & consider that ye Animal receives a supply in proportion to ye waste yt is made, & that ye heart & ye Brain of ye Animal react upon each oyr in a circle so that we are at a loss to distinguish cause from effect, & ye heart by its contraction restores to ye blood ye momentum it had lost in its circulation. We are surely by reasoning merely upon ye structure at a loss to find a limited duration to ye life of Animals, nay merely from reasonings we should conceive yt they were made to continue for ever, & we only learn ye contrary by experience. But

ye

y minute duration given a greater brevity yet
only by y. severity of y. effect it upon & thus
males are not even frequently by y. inevitable
accidents of long life. This power if preserving
all however would not have appeared so great
as y. power of limiting all y. kinds to certain
period. But from y. accidents of life, & from
what experience teaches, we see y. necessity
of y. power y. Animals possess of generating
their like. ( )

Over all, y. skin is thrown, & connected
by y. muscles by a substance called cellular
in order to prevent y. too great evaporation
of y. fluids, & to exchange what is unfit
by its sensibility it enables Animals to
avoid danger, & in fine it is necessary
to preserve y. motions during sleep
tence. ( )

( ) Thus I have given you such an
account of y. structure of y. body, & of its
economy as I thought necessary, before we
entered w. accuracy upon y. structure of
y. particular parts. ( )

Lecture 4th

Lect: 9th Osteology

The Bones were for y. most part of y. softer
Organs in many instances, as in y. head of y.
chest, y. lower parts of y. trunk, & in all for
their support & attachment, & hence a proper
knowledge of these is evidently necessary for
understanding y. other parts of y. subject.

In treating of y. Bones which upon
y. whole follow as a text book y. treatise
published many years ago by my Father, but
with y. liberty of differing from him not only
in my arrangement & method, but in y. conclu-
sions drawn from y. structure, as often as
may seem necessary. If you look into that
work, you will find it divided into two parts
y. first part treats of y. bones or bones in
general, y. 2d. of y. Skeleton. By an exa-
mation of y. bones in general, you will gain
understood, not merely y. of y. size and
structure, but of all y. other parts y. are
connected w.th them, & y.t y. texture, y. proper-
ties, y. use of each, are accurately treated
. Now I apprehend it will be more convin-
tent w.th y. plan I have laid down, to

finish,

ſ̈ joints then to begin ſ̈ enquiry wᵗ this great
& universal endeavour to know ſ̈ steps
situation, connexion, & energy of every part then
trace its vessels, its nerves, then ſ̈ joints
wᵗ ſ̈ structure of ſ̈ bones, & hence after
we have treated of all ſ̈ softer organs
will men denudes ſ̈ bones, we would exa-
mine it, I do not however mean to insist
upon ſ̈ absolute necessity of keeping strictly
to method in this particular enquiry, since
cause that in many other places it is ne-
cessary in ſ̈ examination of ſ̈ brain, of its func-
tions, of ſ̈ lungs, of ſ̈ skin &c where we
receive instruction from tracing ſ̈ course
of ſ̈ vessels, which throws light upon ſ̈
manner in which ſ̈ functions are per-
med, ſ̈ bones are supplied by small
vessels & nerves from ſ̈ neighbouring
parts. However when we mean to in-
struct beginners at large, ſ̈ order of ſ̈
treatise should be in a great measure in-
verted. For we cannot have a just notion
of all ſ̈ uses of ſ̈ Cartilages, ligaments
glands in ſ̈ joints &c. till ſ̈ structure

&

Animals, & yet other parts to have one, perhaps on
the loss of some substance, in the other
mentioned in y. next case, may renew y. same
part parts of y. brain, & shall begin a
regitation of the Motion.

The hardness of y. bone is found to
depend upon y. great quantity of earth which
enters into their composition, for after a bone
has for many hours been burnt in y. fire
it stands retain their shape, & it is imagined
will not to have lost more than one third
of its weight, the separation of its constituent
parts to different different stones, from
y. different hardness of y. bones, & also
differs in different Animals.

When we examine y. texture of bones
we find y. it is composed of plates, or
layers, or lamellæ, which are united one
in bones y. have been long exposed to y.
weather, but we may know y. y. lamellæ
are composed of fibres, we seem to see them
when we taste of y. thigh bone of an adult
but we may method some deception, as
y. fibres of y. muscles around y. bone, may

have

have made a print upon it, & but when we
examine the bones somewhat, as in the flat bones
of the head, the fibrous structure is very evid:
but we can by proper art demonstrate the
fibres in the most solid bones of the body, as
in the middle of the thigh bone of an adult, where
by dissolving it, we can render the fibres
evident as in a dried piece of flesh. But
when we cut a bone, whatsoever be the shape
we find that it is cavernous, there is not an
entire vacuity, a total want of spongy substance,
but there is a number of cells, or
cancelli towards the epiphisies of the long
bones, there are more numerous than to-
wards the middle, & in the same proportion
the thickness of the solid sides diminishes.
The several cancelli are filled with marrow
which is not merely bounded by the cavity
matter of the bone, but is contained in a
membrane, for after a bone is broken
the marrow can be shaked out of it in a
Cylindrical form, even after it is boiled
& the heat is sufficient to melt the oil, &
it is divided into much more minute

parts

parts than we would at first sight suppose
& when we examine ye bones w^t very great
accuracy, we find y^t ye marrow passes between
ye several layers -

Now, besides ye advantages, which we
may derive from ye marrow, which is depos-
ited, there are very evident purposes served
by ye hollowness of ye bones. By this means
1 ye surface of ye bones is greatly enlarged;
ye vessels & nerves are better supported, & ye ends
2 of ye bones being greatly enlarged, we stand
upon a broader & more secure basis, & in
3 ye case of ye different accidents of life
ye bones are made stronger, they resist
more ye breaking, suppose ye bone squee-
zed into a solid, it is evident that will
break easier by laying it upon your knee
than when it is hollow, & ye diameter
enlarged -

Next when we examine a recent sub
ject, we find y^t ye surface of ye bone is
covered by a membrane, which we there-
fore name from its situation periosteum,
generally ye name of ostemum is added

(accum-

cannot many Authors instead of calling it a membrane in which ye marrow is contained ye membranes of ye marrow nam ye fibrous not perioston. This membrane adheres very closely to ye surface of ye bones, it is concealed to them in ye recent subject by a great many threads, & many of these are fully seen membrous, & serve for ye connexion, but many others are reserved into which an injection can be made easily to pass, & in like manner we can inject ye membrane that contains ye marrow, & inject it appear in it, even when great pains are not taken to push ye injection. I must certainly detain ye containing ye juice of ye substance, it seems to allow it reserved to divide upon it, & there are many other purposes which it certainly serves, as well as some which it is supposed to serve, that are meer uncertainty.

Next let us attend to ye manner in which ye several pieces of our bones are connected. First we observe yt ye jagged edges of some bones, may in certain places make a connexion wt ye neighbouring one, as in ye bones of ye head, & this is called by Anatomists a

Suture

future & here motion is not intended, but is for
other purpose which shall explain afterwards.
2. When motion is intended but where most motion
would be dangerous, as in ye spine, or where
are vital parts be are bound here, ye bones are
glued to each other, by a substance which appears
here in Family, but being much digested, as
do not find it commonly, & which is call'd Gelli-
tage. But if a free motion, as in ye pluemitées
& in long be vase & necessary, motion. Sometimes
ye matter connecting are here & each other
wch that ye is are intended in above parts
which are name from ye ligament, & be-
tween ye bones is play easily, they are joined by
wch Cartilage, which is covered wth a very small
membrane, & there are substances, like mass
of salt wch in ye joints, & which have ye
same respects entering into them, yt. shall serve
for lubricating ye joints, & il protects ye glands
which pour out ligaments, which were imme-
diately serve for ye purpose. Thus I shall
hand in all yt is necessary for ye purpose
as for ye examination of ye

Skeleton, or ye bones dried & joined

by

together the number of pores that compose y
Skulle, will be some greater than at first wight
ye would imagine, & that from what Skulles y
there are sutures, or fissures between bones, where
motion is not intended, as y head, when y lower
jaw is taken away, looks as if it were entire
but it consists of 4 pieces. Not
almost every one of y bones of y Skull, origi-
nally consisted of different parts, which in
y bones of subjects of 12, or 15 years of age
by steeping them in water, can be separated
again, as in y thigh bone, y manner how is
wanting &c. The explanation of this w. y y
ossification of y principal pieces begins in
y middle, & natural to harden y more
until advance slowly from a single point
begins y ossification in certain parts of y
epicmilies, which gradually expanding till
y ends meet, they run together w some force
y they unite, & y marks of y former divi-
sion does not at all remain, such pieces
are generally named by Authors. y first type
or something growing upon y end of y bone
& these after they are fixed inseparably to
y

y. bone are called Epiphyses, or succedanea, so that y. greater number of y. Epiphyses have been usually Epiphyses. The fibres should nearly in right lines, & therefore when y. ossification is complicated, they form an irregular mass. The Epiphyses are united to y. bone, & usually ossified generally about 15 years of age.

Except you will allow to y. general shape four Bones, they are commonly divided into 3 Classes, y. broad & flat bones, & y. long & round bones. But tho' it is in vain to attempt any accurate division of this kind, yet it is worth while to observe y. this division cannot comprehend all y. pieces of bone in our body, for many are of a round & irregular shape, so we ought to add a 3d. Class of spherical shaped bones, & to add y. term irregular, as they differ very much from a real sphere, so they may be called Spherical irregular.

Let us next attend to y. situation of y. pieces, there are many of these placed necessarily in various directions, as in y. extremities of y. body, but when you attend to y. middle column on which we rest, to y. back bone

&

Flower aplumiliæ, you can not find that ye vessel
passes in their perpendicularly over each other
so that ye Machine is constructed, as a Mason
would construct ye fabric of a house, but there
are many turns, ye first of ye spine is towards
backwards, then it comes forwards again
then there is a deep hollow at ye back, ye spine
proceeding backwards, then it proceeds for-
wards then backwards again, forming a
hollow on ye back part, on this portion re-
presents an Italick S The lower aplumiliæ
are not placed immediately under ye column
but at ye side. nay ye bottom is not imme-
diately under ye top, but further inwards
when we walk, all which turns serve to
support ye large ye necessary bowels, viz
last of ye spine supports ye soft parts at
ye back part of ye mouth & throat, ye low-
ermost in ye Thorax presents ye bowels
there from gravitating immediately upon
ye hollow, Bowels within ye pelvis. At
ye under part of ye trunk, there are spread
on each ye large muscles, which serve to
move ye lower aplumiliæ, & for ye different

aplumiliæ
aplumiliæ

extremities exercise, how y. Bones in y. thigh y. thigh bone is turned inwards, otherwise we must have thrown our body from side to side, whereas in consequence of this turn, our knees y. feet nearer to each other, & less motion is necessary, (But y. attention to this Circumstance leads us to perceive y. reason of a fact we all know), that we cannot remain in any one posture long without being wearied as we are under a necessity of acting w.th a number of our muscles.

Having discovered these general Circumstances relative to y. Skeleton, we proceed to make a proper division of it into parts, & to determine y. order in which we are to consider it. The most common & obvious division is into y. head, trunk, extremities, & it is y. best, we therefore begin w.th y. examination of y. head, it consists of y. brain case, or Cranium, & of y. bones of y. face, or y. two jaws, y. upper one is connected intimately w.th y. Cranium without motion. We begin w.th y.

Cranium, which in shape very

much

much resembles an Egg w.ch y.e small end turned
forwards, you can explain y.e reason of y.e shape
because you have seen, that to y.e Brain, y.e
Cerebellum and y.e back part is added, & hence
more room is necessary. But y.e first reason
of y.e shape lay no means appears. If we are
to go further, we will not say w.t Athenæus
y.t y.e bones are disposed to shoal in a particu-
lar manner, which gives that shape, but
that y.e Brain & Cerebellum were as y.e mat.ls
on which y.e bones form, or that y.e shape of
these is such as you see; for reasons that
we are entirely ignorant of. Nor y.e Brain
& Cerebellum are formed before y.e Scarification
begins, & y.e bone follows y.e shape of y.e
membrane that forms y.e rudiments of y.e
Brain.

Independent of y.e advantages in y.e
operation of y.e functions belonging to y.e Ner-
vous System, we see benefit from y.e Spher-
ical figure, it is not only most capacious,
but that regular equal accidents more
are apt to happen in every where formed, & y.e bones
are not so easily broken. But we can go

further

further, & perceive advantages from y^e^ oblong figure, because y^e^ fore & back parts are most exposed to injury, y^u^ all know y^e^ difficulty of pressing together y^e^ ends of an egg, & to increase this roundness y^e^ Cranium is brought out: y^e^ also pass more easily among the shoes, w^t^ out receiving injury, & more especially we observe an advantage, when we consider y^e^ situation of y^e^ organs of hearing & sight The external ear is less exposed to injury by y^e^ long shape, whilst sound makes a stronger impression upon y^e^ organ; & y^e^ sphere of vision is more extended than if y^e^ Cranium had been brought into y^e^ perfect sphere.

The natural shape we observe may be changed very early in life not only by diseases, which distend y^e^ parts w^t^ violence; as y^e^ Hydrocephalus, which alters greatly y^e^ shape of y^e^ head, but by habit or any accident a changed can be produced, as if a person when young has a very neat, that side of y^e^ head alters its shape, which shews y^t^ y^e^ bone

have readily accommodated themselves to their particular
Way. Havalius pretended that he could distinguish
different nations from observing y^e shape of
y^e Skull, when there was a communication
among y^e different kingdoms, & they were
more attached to particular customs, as y^e
Skull, for Turks in manner, from their posing
y^e head on y^e Turban, in Germans from
their laying Children to sleep upon y^e occiput
that part is broader & flater), whereas in
England & Holland from their turning Chil-
dren from side to side, y^e skull is of a more
oblong shape.

After considering y^e general shape, we
would call y^e skull to observe ye structure
the thickness varies in different places, in
general we find it thinner above than
below, & that for two reasons; 1^st is ori-
ginally so, because y^e upper part of y^e
Cranium is less exposed to injury, but y^e
proportions vary w^th years, for y^e muscles
being necessarily placed chiefly below, &
acting on one side, while y^e Brain is
gravitating on y^e other, y^e base is conti-
nually

mostly pneumatic, so that ye difference in ye proportion in old people is much more
. Let us now consider ye composition
fit if you take it. Authors generally
them describing it do much resemble one
describing ye tables, viz. what they call
an internal diploe, as if there was no
thing any particular in ye structure of ye
cranium, but it agreed wth every other
bone of ye body, as ye Os ilium at ye bottom
of ye trunk. We find no diversity in de-
scribing ye bones in general Cancelli in all
of them, & ye only thing particular to be observed
in, that ye Cells are rather smaller than
they are elsewhere, because ye part is
more exposed to injury, so ye solid parts
have not so much taken from them for
ye formation of Cancelli, but in other respects
it has ye common structure. If we care-
fully attend to ye thickness of ye tables
we shall find what Authors universally
describe, that ye external table is thicker
than ye inner, & hence ye name of Vitrea
or Glassy, as brittle is assigned to ye inner
one

most, but y. difference is by no means so great as han been commonly alledged, & it is not more than we can readily account for. The ossification from a law of nature, which we can't explain, begins in y. middle of a flat bone, & y. fibres extend to all sides now it is evident that y. extent of y. outer table must be greater than that of y. inner because it describes a portion of a larger Circle, as y. plates of y. inner table are more pressed & resisted, & are more compact & dense, besides y. dilatation of y. Brain affects y. inner table more than y. outer. But we are by no means to sound upon this so much as is done by many in practice, as that other matter, whether from internal or external causes han formed in y. Cancelli, it will of course, or at least more readily fall in upon y. Brain. Then that it may have, per y. acrid matter shall erode y. inner table sooner than y. outer, may y. it may be more disposed to give upon y. inner than y. outer, yet in

per

genral where a suffusion forms how it varies
do may obviated, as in ye rest of ye body, but
here ye error even ye safe side, & when we
know that a suffusion has begun, we are
careful to watch ye consequences & when we
know that matter has formed, from ye thick-
ness & oedematous appearance, we may
make an incision into ye integuments, &
then where ye symptoms are urgent, we may
proceed to take out a piece without any mor-
tal danger to ye patient, even suppose
we are in a mistake, we only avoid letting
in ye air upon ye brain by not perforating
ye inner membrane, Not that ye letting in
ye air is so suddenly fatal as some suppose,
but it is hurtful, & is to be avoided
when it can be done, Neither are we
wt Surgeons in performing ye operation
of ye trepan to follow ye rule they have laid
down, yt we may cut ye bone very quickly,
till we find certain degree of manl
resistance; or till we come to ye Cancelli
when we are to go on more slowly, be-
cause it often happens particularly in
elderly

elderly people that we scarcely can see y. distinction between y. Tables, & therefore in many case we are not able to determine from y. want of resistance from y. difference of sound, or from y. blood discharged when we come to y. Diploe, so we are to proceed in this operation w.th y greatest caution, supposing y. texture of y. Skull uniform throughout But when we compare a variety of subjects w.th each other, we next find y.t beside y. utmost difference in y. general structure even in persons of y. same age, & still more in persons of different ages, when we compare y. old w.th y. young, in some persons there is a very remarkable difference of thickness in particular places, & where we cannot well assign y. cause. Notice you some skulls, which are in y.r parts disproportionate, that there is no mark of any erosion, but merely that certain parts of y. Brain have grown luxuriantly, in consequence of a certain distribution of y. blood we scarce suppose but y. fact is not so but to be known

opt.mus

otherwise we might call it the tell., & get rid of y. brain before we imagine, we had cut thro' y. Cipher. It occurs in other subjects also in particular places, which are remarkably transparent, owing to y. melting of a number of branches of a vein into a trunk. In some few places I have observed this to depend upon a spongy flesh growing between y. bone & y. membrane or dura mater, which tunes y. bone. The trunks of y. respective vessels upon y. outside of this membrane, & whilst y. membrane is supplied w.t respective, y. bone is supplied likewise, & from a number of these Branches forming trunks fills come to be formed. In other cases where there are marks of disease, or at least where it is probable there have been diseases, we find a prodigious difference of y. thickness in different places. I begin w.t shewing you a very great curiosity of y. kind, a part of y. skull of a rickety person, that is wanting of an inch in thickness, about

ysh.

by such & where yt wound hath seem to have
been separated so that there is seene any diss-
tinction betweene yt inner lamella & yt osseo
or Concelli but yt denotes appeare almost
uniform thickenit. I have another skull here wch
seems to have been in a diseased state, that
I will know yt History of it, in some parts
it is remarkably thick, while in others it
is remarkably thin & yt in a most unequal
way, & it is remarkably light. I shew you
another of a person who laboured under yt
Spina Ventosa, or Exostosis of yt Bones, &
where matter has been collected in yt Di-
ploe or Concelli, & yt matter has made
its way thro yt outer, not yt inner table
in several places, tho in some it has gone
thro yt inner also. You suppose this di-
sease not to have gone to its utmost length
we may suppose that those portions where
yt tables are separated shall continue
much thicker than yt neighbouring, for
when these parts are filled up by yt gra-
nulating flesh, yt neighbouring parts will
be deprived of their proper degree of

nourish-

nourishment, there is necessarily like a drain carrying away of nourishment. In enquiring any Surgical question upon it, shall we are to attend to it's age of it's patient, it's constitution, to it's accidents & diseases which he may have been subject; so that we would observe from considering it's general texture of it's Skull & it's appearance &c. to Tables.

Next you will remark it's surface. The outer surface of it's Cranium at it's upper part is every where almost smooth, because except at it's sides of it's head, where it's temporal muscles are placed, there is hardly any organ of such strength as can affect it, but below we find it's Cranium very unequal, partly owing to its connexion w.th it's bones of it's face, partly to it's attachment & effect which it's muscles have upon it, & it is especially made unequal to alter & vary it's effect of it's muscles, so it appears every where rough.

When we examine it's inner side we find upon it's lower part inequalities not

not only certain bones arising upon, but against many prints made upon ye bones, which are so evident upon ye upper portions. There is a proof of ye effect ye brain has in winters deeper into ye bone, for this Difference is continually increasing by years, we observe certain furrows which are made by large vessels conveying venous blood, But besides these, we perceive a print made every where by branches resembling those of a fine exsplant, & which are produced by ye arteries upon ye outside of ye Dura mater. The ye common appearance of these in a person of middle age, but in very old persons these furrows become much more remarkable If a skull has been to be fractured ye cracks readily follows one of ye furrows Now, whether are we to Attribute to any of ye bone has an inclination to grow round ye vessels, or ye vessels by their strong & swelling force their way into ye bone. That this is ye case is evident, since they increase by age, ye arteries always become deeper in

in y^e bone of y^e Skull. But when we are consid.
ering y^e general Humours, we are not merely
to suppose that y^e bone is more compacted
but there is a continual change operating
y^e earth is taken up & again supplied, as y^e
in a great quantity of y^e earthy matter carri.
ed off from y^e bones of elderly persons, &
at y^e same time propane may contribute

Sect: 8th

Having now considered y^e general structure
of y^e Cranium we now proceed to examine
y^e particular pieces which compose it.

We shall find that there are 8 large A
pieces, which are constantly to be found in
all subjects, & in many we also find small
irregular connected pieces, called Wormian
ossa: triquetra in y^e Intestines. We shall
put together any two of them, if we
desire some attention, to see them, &
they remain fixed like y^e teeth of a saw
& y^e figure between them is called Sut.
ture. The Bone in y^e fore part of y^e
head is from its situation called Os
frontis, further back we find two
pieces

pieces, which make ye inner, or middle
of ye three, & are therefore named ossa parietalia
vulgaria, ye two first of ye head like ye first
is composed of a single bone, ye occipital or
occipitall bone, lower than ye parietall bones
& connected wth ye Cheek bones we find two
small irregular shaped pieces, which are
named from their situation in ye Temples
ye Temporal bones, two still remain placed
in ye under part of ye head ye first of these
is called ye sphenoid bone, because it
seems to resemble a wedge, broad above
& narrow below, some have called it
alisphenoid as ye sides look like wings.
The remaining piece is perforated by many
small holes like a sieve, & it is therefore
named ye ethmoid, or cribriform bone.
In considering ye situation of these bones
we are led to consider ye several
sutures. Anatomists have a very absurd
way of saying that these join ye bones
they are ye contrary certainly separate
them. We have one suture between

ye

yt frontal bone & yt parietal bones, which being
near to yt place where yt antients were their
corona, is generally named yt coronal suture
in yt back part of yt head, you find yt occipi-
tal bone joined in a similar way to yt backs
of yt parietal bones, but yt figure of this su-
ture is not so circular as yt other, we are
apt to Angle at yt middle of it, or form
the resembling our little v inverted or a
Greek Lambda, it is called yt Lambdoid su-
ture. Some apply this term to yt division
between yt occipital & parietal bones wch is
calling yt remainder on either side between
yt occipital & temporal bones, yt additamen-
tum of yt sutures, but we may comprc-
hend all one name. The Suture between
yt ossa parietalia again, being so stret-
ched between yt middle of yt Coronal &c
yt middle of yt Lambdoid suture, as an
arrow is stretched between yt string of
a Bow, it has been called yt Sagittal
suture. These 3 Sutures are all termi-
ned like yt teeth of a saw, but at yt side
of yt head we find yt temporal bone tying

over

and of particular, as on each of a pair to bring another, or on like are laid upon a roof. Some thin suture is named squamous or scaly. It still remains to show of sutures surrounding of sphenoid, & of ethmoid bones. The Sphenoid bone is connected to all of bones of Cranium. So Anatomists find themselves at a loss to continue names for all of sutures & call them in general of Sphenoidal suture. The last bone, of ethmoid only fills up a very small part of of Cranium, & is separated from of neighbouring bones by what is called of ethmoidal suture.

Before we go any further we would wish to have explained to us of reason why of Cranium consists of so many different piece, seeing that in of most perfect state of sutures remain, & yet evidently motion is not intended. Now, to explain this you must recollect what I showed yesterday of of several bones, more especially of flat bones begin their ossification in certain points, & of bones in general are composed of fibres, which gradually as you grow

from certain points, that there is no general
harmony, which originally induced y. Dream
but that it begins to change into bones in cer-
tain points; Now taking that as a law of
nature that it is best, because we find it so
; it seems that this thing of ours y whole pe-
riod is never completed. But not as a spheri-
cal figure is intended, & in some places w.
irregularities, that figures is more accurately
formed by a number of ossifications than by
a few, as y. more you increase y. number of
sides of a figure, y. nearer you make it ap-
proach to a circle, as in y case of y. moon
we are in, which consisting of 8 pieces ap-
proaches nearer to a circle than if it only
consisted four. The fibres are directed from
y. first point of ossification mainly in
straight lines, as they come out like rays
from y. centre of motion, therefore they are
curving as they proceed, so yt. y. further
you go from y. first points, y. bones are
constantly becoming thinner & weaker, &
in fact I find upon trial, that y. middle
of every one of y. pieces of y. cranium, is
more

more dense, more solid than y^e edges, so y^t
greater y^e number of pieces in y^e more y^e
spreading of y^e pieces is prevented, & y^e more
equable y^e strength of y^e whole becomes. this
to this another fact, y^t in proportion as y^e
parts of our body grow bigger, y^e growth of
them in y^e thickness & more especially y^e growth
of y^e bones is slower than that among y^e
y^e softer parts. Thus w^t regard to y^e teeth, a
certain number of them are changed, as
from their greater hardness they do not
grow in y^e same proportion, & it is easier
to change y^e first set, than to enlarge it
we may surely apply this to y^e Brain, & to
y^e bones covering it, y^e Brain unless interstices had been left, so y^t y^e pieces might have been pushed asunder by y^e growth of y^e Brain, that organ would have been cramped in its growth, & if y^e brain case had been one solid bone, it would not have allowed y^e Brain to have extended sufficiently. this as a last use, I would add to y^e y^t a number of pieces are formed in our favour, y^t the birth of a child might be

rendered easier, & Accoucheurs well know, that
y. shape of y. head in labour is very much chan
ged, so y. dangers is to be feared both to y. Child
y. mother. & those I assign here are y. chief. if
not y. only primary purposes, which y. num
ber of sutures can be said to serve, but there
are other secondary effects which well merit
our attention.

1st Fractures do not extend so far as they
otherwise might have done, y. about of a
fracture is interrupted in a great measure by
y. serial suture it made it not y. in y.
most compleate state of y. body, in y. full
growth, where y. bones press strongly against
each other, the Course is absolutely interrup
ted, where y. blow is very violent, but it
is at least prevented from going so far
as it otherwise might, I have got in my
hand a Skull y. proves both Circumstan.
y. person was killed when in Liquor by
a fall of about 30 feet into a Vault, & y. head
seemed to have struck upon some pointed
substance, for a piece of y. bone was quite
loose. from y. place of y. fracture explendo

rays

ner for y. Lambdoidal suture, nor y. suture (even not
prevent y. eyelid) but you observe that it termi-
nates exactly at y. Sagittal suture. Now it is
probable y.t without y. intervention of this suture
y. fracture would have gone further.

(This observation leads me to shew some
facts w.ch regard to y. change which y. suture
undergo by age, & first it is material to ob-
serve to you, that y. sutures are constantly
better seen upon y. outer side of y. skull
than upon y. inner, because, as I have hinted
y. ossification begins in y. middle of y. bone
& extends from that equally on both y. tables
so y. fibres meet sooner when they are closer
together, & there is not room for y. deposi-
tion, as they are pressed flat & turned
outwards into y. Cancelli or diploe where
there is least resistance. The bones
are constantly growing closer & closer together
& y. external layer has some effect in this,
for all y. parts of our body by age shrink
& y. most parts shrink most by y.
absorption of their humidity, so y. brain
shrinking more than y. bone, y. external

air

air comes to act w^th greater force. But y^e fact is y^t y^e sutures in elderly people are obliterated
Now you would suppose they twist (disappear upon y^e inner (side, where y^e bones press on) each other closely, & from this circumstance a fracture may extend further in y^e inner table than y^e outer. In y^e Memoirs of y^e French Academy of Surgery there is an instance of that kind. The fracture was treated in y^e common way, but after y^e patient's death it was found to have extended further in y^e inner table than in y^e outer, & a splinter projecting from it seemed to have occasioned y^e patient's death, it was found to have extended further. And this will more readily happen in elderly persons, where while y^e inner table is one continued lamina there is a greater thickness of y^e bones

2 Another secondary use of y^e Sutures is, that in Children y^e dura mater is better supplied y^e external membranes join w^th y^e internal, & are closely connected by fibres many of which are ligamentous, while others are perforating, that

y^e

that such a support in ye Inferiour parts of ye brain
is so very necessary, as many Anatomists
& Surgeons have supposed, from their not
considering that ye Dura mater is intimately
intimately connected to ye brain by vessels, that
it is in reality ye external periosteum of ye
inner table. But we may observe upon this
greater connexion, that ye Facil dura mitis of some
application in practice, that in reality there
are more vessels, & those larger near ye sutures
than elsewhere & hence ceteris paribus in
diseases of ye head, there may be more ad-
vantage from Cupping or applying blisters
or Forming issues near to ye sutures than
even ye middle & more solid parts of ye brain
where ye communication wt ye parts wtin
is less free.

Lastly I would observe that ye number
of sutures allows ye Cranium not only to alter
its shape in ye time of delivery, but af-
terwards from various causes yt ye brain
yielding, ye Brain may be extended wt
less impediment, as in ye Hydrocephalus, where
there have been a considerable quantity of water
accumulated

accumulated within y. Ventricles, which is not sufficiently remarked by Dr. Mugll. I'm a subject of 3 years old I found 32 Ounces, & in another of 9 years near 3 lbs. The Disease generally proves fatal before many Ounces are collected, & in these cases if y. bones had not yielded, y. Disease would have never proved fatal, & in other Diseases, where there may be discovered an increase of Bulk y. yielding of y. Bones in young Children may have a good effect, In certain cases where y. Cranium composed of one bone, y. Disease must have proved fatal, whereas by y. yielding y. patient recovers, may in y. Sept books you find some Authors quoted who have described cases of Adults in whom y. sutures were opened, that because y. patient survived, y. cause was not well known. we have one instance of this case by Simpson of St. Andrews, & another by Mr. Hill Surgeon in Dumfries, & I was informed of another last Winter by a Gentleman who attended Lectures here On them all y. Surgeon could place his

finger

singer between y^e bones, & in them all y^e bones
closed again. In that case by D^r Sennert
he, suspecting water made a Drain, & more
than ordinary quantity of water came away
for several months, & at y^e end of 6 months
y^e patient was considerably relieved, tho
sore tho' some are killed by water collected
in y^e head w^t out its opening y^e sutures, yet
in other cases y^e force is sufficient to open
them, & y^e patient survives.

So far we observe of y^e constant pieces
that compose y^e Cranium, but there are small
bones found in y^e Interstices & y^e larger
bones called ossa triquetra, Now these gen-
rally speaking are to be observed in y^e
Lambdoid future, w^t out our being well able
to assign a reason for this, but we observe
it as a fact, & they are sometimes of very
great size, as large as a Crown piece.
But tho' they are generally found in y^e
Lambdoid suture, yet sometimes we
find them in y^e other sutures, as in
y^e Sagittal, where it meets w^t y^e Coro-
nal. We must consider these very much

as

in known nature, which we will shortly re-
fer them in y. human Species
who have never laboured under disease of
y. head. In some cases they are produced in
another way, they are formed in y. Hydroce-
phalus, where y. bones have been considera-
bly distended & separated, when small bits
have begun to form in y. membranes betwen,
nature attempting to fill up y. void. The know-
ledge of them to a Surgeon is evidently use-
ful that he may not run into a mistake
like to that which y. Superstitious name into of
supposing a natural suture to be a fracture
The distinction is evident, y. former runs
in a streight line, is not serrated, & is very
different from y. suture, y. edges of which
is smooth, & on y. same level wt. y. rest
of y. bones, y. fractured just to be trying is
memorable, that this is not always y. case
but y. several circumstances being join
together, there can be little danger of falling
into mistake, Having now shown &
explained y. general Structure of y. head
I shall proceed to demonstrate y. fractures

cular fuccus beginning at y.

Os frontis (As this bone is much exposed, we find it remarkably thick & y. two sinus's having stung, it also receives a small branch from y. others, which considerably increases its strength. The outer part of it, as far as it is exposed is smooth, as it is only covered by y. thin muscular Organ, which is rather calculated to smooth y. bone, than to make any impressions upon it. Wt in it is smooth at y. upper part, as y. lobes of y. brain will bear much upon it in y. erect posture, in y. Quadruped this part is more uneven, & y. lowermost part of it is in y. human subject. In y. middle we observe a ridge at y. bottom, & above there is a furrow. To explain this you will observe that in a child this bone is composed of two pieces & when these come to press against each other y. they do so very closely, as nature intends to unite them; & y. fibres are readily turned inwards, where they find y. least resistance y. is between y. two great lobes, or hemispheres of y. brain, in y. manner y.

account for ye assurance of ye ridge, wch serves to give an additional strength, & a more commodious connexion to what is named ye sat (ye m^n^ is resembling a scythe, & ye sinus wch is occasioned by a large vein, wch is included within ye sat, wch is a doubling of ye membrane). One conclusion we would draw from knowing ye situation of ye ridge & ye furrow above is, that we would avoid ye applying ye Trepan in ye very middle of ye bone, & much as possible, where a bit of bone can best be spared. ye sinus I have caused ye trepan to be placed immediately over it, but we would avoid it, if we have a choice, & a neighbouring part will serve ye purpose & where we are under a necessity of operating upon ye middle, we must proceed very slowly, whereby we are in less danger of cutting ye tough membrane, wch yields before ye instrument. At ye under part of this bone we find two ridges on which our eyebrows are placed, therefore named superciliary ridges, & they project very considerably especially at ye outer side, where there is

a

a deep cavity formed, wch in wt of ye glass of ye
paracentesis can learn is placed, & ye nidge in order
to protect ye ball of ye eye (even when a convul-
sive) may. So if it is necessary in order
to discharge matter from ye cranium to
make an opening here, we could avoid ye lower
part of this bone, whereas we enter ye eye if
had an instance of this kind communicate
some, where a person had this bone bur-
sty by a fall, & ye surprise of some ye
surgeons, there was no opening into ye cra-
nium, so ye opening should be made ye
breadth of a finger above ye edge of ye
superciliary ridge. The orbitar plate
is generally thin, particularly in old per-
sons, so there may be danger from sharp
pointed Instruments, thrust into ye orbit,
may there are examples where by a stroke
upon ye eye ye person has died, ye Con-
cussion being communicated from ye
bone to ye brain. The artery which
supplies ye ball of ye eye, & therefore
named ocular, does not come from ye
external Carotid, according to this bone,
but

but from y^e internal, so y^t this is one of y^e few violations in point of fact w^ch Winslow has committed. After y^e Eye is supplied blood then come out in y^e forehead, making y^e supra frontal artery as anterior, w^ch are allended w^t considerable noise. The artery comes out from a notch in y^e supercilliary ridge & in many subjects there is also another ingenious Gentleman Dr Blair has supposed y^e opening of this artery in persons affecting y^e head, he probably was led to suppose this from an observation in Hippocrates that where y^e Blood had been discharged from y^e nose in such cases y^e discharge has proved y^e Crisis of y^e disorder, he may also have gone into y^e violation of Winslow, that y^e branches were derived immediately from y^e internal carotid. Now, tho y^e proposal seems very probable yet I apprehend that it is by no means to be tho^t of in practice. For it is greatly to be doubted whether y^e few drops of blood from y^e nose mentioned by Hippocrates, proved a Crisis of y^e disorder. It is more likely

y^e

y^t by y^e genral struggle of nature about y^e
Crisis, a few drops of blood more discharged
& that this may more y^e affect than y^e losse
of y^e Cure. Besides y^e drawing of y^e blood
from y^t artery is highly dangerous on account
of y^e nerves which accompany it, & y^e operation
is not less difficult, as we are not able to dis-
tinguish y^e obstac of y^e artery w^t y^e finger
& y^e toole & hole vary in different persons
for y^e most part y^e artery is not bigger than
a slitching wire. so it is better to let y^e blood
from y^e temporal artery, where y^e operation is
more effectual, & more easily done. In y^e fron-
tal bone there are certain cavernes or sinuses
placed above y^e roof of y^e nose, & from y^e
frontal bone being composed of two originall
pieces, we find a partition between them
& y^e cavities on each side seldom if ever
communicate. In a Child at Birth, there is
only a sponginesse & thickness of y^e bone, but
there is not room for any considerable cavity
by degrees they enlarge very greatly in some
persons, & we may gess by some a judgement
of y^e size from looking at y^e forehead w^t
in

much flatter in some than in others
sometimes y. enlargement is unequal, greater
on y. one side than y. other sometimes they
extend y. whole breadth of y. orbitar
plate, & we find in each of them imperfect par-
titions, & we shall afterwards find that they
communicate w.t y. nose. At present I entirely
avoid saying any thing further of these sinuses than
what respects their general place, for we
can't judge of their use till we have seen
y. whole structure of y. nose of which they
form a part. Only w.t regard to y. applica-
I/ of y. trepan, we surely must have it
it here, because of y. difficulty in y. first
place w.t which y. Instrument might
be made to penetrate y. two places in
have a different direction. Sept we
must take into account y. degree of pain
you y.t may follow from y. wound of y.
sinuses, y. Inflam.n y.t may take place
This how been exaggerated but we must allow
y.t y. membrance lining them are very sen-
sible. Besides y. matter discharged from
y. Brain, not getting out w.t corrupt &
acrid

cavion cavity, wch might be communicated to y.
Brain; & from their communicating wth y. mem-
bilo, we wd giue y.e accesse to y.e air, wch we
know to be hurtful in such cases. Therefore
unless they are forced to it, Surgeons ought to
avoid this place. Hence I thought (save
where I prevailed upon y. Surgeon to perform
y. operation here, & to take away a great share
of one of y. frontal sinuses, wch apeard to y. plate
y.t separated y. Brain from y. Eye, y. less
was leave, & y. sharp point raised upwards, but
unless in such a particular cave, where we
mean to give a discharge to y.e humour higher)

Another remark remains, y.t in y.
operation in originall it consisted of two pieces
it will pretty frequently happen, y.t there will
not be accurately united, & hence we will
find y. Sagittal suture continued to y.e nose
It is alledged y.t such a division is more
freq.t in women than in men, as y. ossification
in them does not proceed wth y. same
force

Lect: 9th

Sect: 9th

We next proceed to examine y.

Parietal bones. Under y. Angular Suture we find y. continuation of y. Sinus, mentioned in speaking of y. last bone. Into ye y. large venous Canal, which passing y. inside we call Sinus, is continued here y. remarks we made w.t regard to y. Occipital also applies here. In most subjects we find two chief of y. Branches of y. artery of y. inner side, as some have alledged, communicating w.t y. branches from y. veins on y. outer side, & this shows y. communication of y. external veins w.t y. Internal. But in wounds this has no considerable, as in slight punctures stops blood effectually. But nature intends a communication; so, that y. grand veins leading out of y. head, y. internal Inguinal are stopped, y blood can return in great quantity getting by means of this communication into y. external veins.

The connexion of these bones w.t y. frontal is very curious, & not sufficiently attended to by Authors, where in y. middle

seam

from y. length of y. frontal bone to the sphenoid.
it is in danger of being beat in it takes an
advantage of y. arch formed by y. frontal
revolv upon it, but at y. vertex, where ye
y. frontal bone is in danger of being beat
in but y. parietal, from y. scalp is off y. head
y. corner of y parietal bone is laid over y.
frontal.

In y. Child at y. soft time, y. parietal bones
y. two pieces, which originally compose y.
frontal are imperfect, as you perceive y part
of y. head, which instead of being composed
of bone, is made of membrane, which is quite
transparent, & where y. external pericranium
or pericranium, adheres by threads & fibres
to y. dura mater. From y. softness of this
part you can feel in a child y. motion of
y. brain, & there are two kinds of motion
which one can distinguish. The first is
y. beating of y. arteries of y. Brain, that
however is more or less distinct, according
as y. larger branches of y. arteries upon
y. surface of y Brain happen to be situ-
ated. But y. chief motion is a general swel-
ling

ling & ito subsiding, & which is caused by
expansion upon ye state of respiration. When we
expand our lungs to inspire fully, ye several
branches of ye vessels have not only more room
to let ye blood pass, but they are drawn by
ye touching in of ye air more into straight lines
& hence ye blood passes more readily thro them.
So during expiration, & in ye space of time wch
intervenes between expiration & a fresh inspi-
ration, ye blood passes thro ye lungs wth
more difficulty, hence it is accumulated in
ye veins, in so much that it makes a great
heaving at this particular part, & as ye brain
is confined in every wch part, almost ye whole
swelling is felt here, so it is named ye
pars pulsatilis. I am ye more particular
in describing this motion, because a want
of attention, to it has led several of ye Wri-
ters in Midwifery to lay down a very dan-
gerous rule. That by applying ye finger
here, ye Accoucheur can distinguish whe-
ther a child be alive or not. But this
or no regard is to be paid to ye this motion
For besides ye compression of ye parts, there is

in a considerable thickness of ye membrane, & it is only after three hours time, yt we are able to distinguish ye state of ye ovum, wt regard to ye hearing, which is ye chief motion, that is not yet begun to appear upon ye state of respiration, & ye Child has not yet drawn in ye air, & but a small portion of ye blood passes thro ye lungs, we are to determine ye state of ye Child by other marks by ye previous situation of ye mother, whether ye motion of ye Child has been felt before, from ye date of ye making & separation of ye Cuticle, for if you judge at all from ye pulsation, you attend to ye stroke in ye umbilical Chord, or of ye artery in ye leg or arm.

From this imperfection of ye head we are led to other cautions, as ye bones sometimes in difficult labours overlaps each other, & ye presume is very considerable, we may suppose a case, that I have not met wt an instance of it, where ye brain itself will be pushed out, & form a Hernia, or that it may form such a tumour, as is not unfrequently seen

seen upon ye head of Children, but which is alm.
most always owing to blood or humours under
ye skin, & at any rate incisions are by no
means so often necessary, as Mr Ellis seems
to recommend.

Another remark is this, you have
heard (1) me mention Hydrocephalus, or dropsy
w.t in ye head, & that ye water is sometimes
so collected, as to separate ye different juices
of ye Cranium, & that in Adults, as well
as in Children, that most commonly in Chil.
dren. Now that ye water be generally collec.
ted, perhaps in ye cases of too w.t in ye sub.
stance of ye Brain, yet we would suppose
& it is certain in fact, that it sometimes
collects between ye Dura & pia mater, (2) and
in such a case, we might give ye patient
a better chance of recovery by making a
puncture, & discharging ye water, so expo.
sing a case to prevent, where there is a sep.
aration of ye bones, & a general (division
we are not absolutely certain that ye water
is w.t in ye Brain, perhaps where ye
water is external, ye fluctuation may be,
somewhat

somewhat better felt, but y. brain by being extended is made thin, & a degree of inoculation may be distinguished that is no substance. So we may satisfy ourselves by an experiment we may make, an opening into y. brain & a slight scratch w.t a lancet will be sufficient. I attended a Case of this kind w.t Dr Grant, where this very thing was done, we caused an incision to be made half an inch long thro' y. skin, then y. Surgeon was directed to make an opening w.t caution at y. side of y. Sagittal, avoiding y. middle of it carefully, on account of y. superior longitudinal Sinus, & as y. water did not run out upon cutting y. Dura mater, we made him desist. The Child died not long after, & we found y. water was collected w.t in y. brain. —

We shall next examine y.

Occipital bone. About 18 or 20 years of age we find y. Occipital Sphenoid bone divided by a cartilage, but soon after this they grow firmly together. We see y. manner of this union for a Suture would

have

have been made, as y^t might, if y^e bone would have upon y^e top of y^e spine, & if y^e bone had been thin, & a vulture interposed, & a person carrying a load had fallen, by y^e load pressing against y^e top of y^e spine, thin part of y^e bone might yield, & we are told as a matter of London was killed in this way, falling w^t a burden; y^e process which connects y^e occipital bone to y^e spine was pushed upwards & was supposed to have wounded y^e substance of y^e Brain.

It is alledged in some Anatomical Books, y^t y^e Sagittal suture is sometimes continued as far as y^e Foramen magnum but I apprehend that this notion has arisen from Fœtal Analogy, & without allowing observation at all, y^e mistake may have been owing to two large ossa bujmlia w^c may have gone down a certain way.

Now, after you have seen this structure of y^e Occipital Bone, you will readily agree w^t a general rule y^t is laid down by Surgeons, that where we have y^e choice of y^e place, we ought to avoid applying

of applying & applying of Instrum^t in operating
in general. (Because of y^e unequall measure
of ye thickness, y^e Surgeon meets w^t irregu-
-rity one side will be cut thro' before y^e other
& besides y^e ridges, we meet w^t furrows to
a considerable depth, which are made by
y^e superior longitudinal, & y^e two lateral
sinuses, & no doubt there is a considerable
degree of danger from y^e wounding of these ves-
sels, if y^e Surgeon proceed inconsiderately.
(But we are not to carry this general rule
so far as to discharge operating here alto-
gether. For y^e Surgeon is voluntarily
to his choice), as where matter, or blood
are collected in y^e head, it has made its
way to a particular place, or if a piece of
bone be beat in by a blow, when we
are to ballance between y^e danger of
wounding y^e operation, & of neglecting it
if there is y^e least probability of heal-
-ing y^e bone, we ought certainly to ope-
-rate, observing y^e Cautions of proceeding
slowly & y^e ridges do not make any
insuperable difficulty. For we can cut
w^t

If we use ye Circular Saw, may it not appear to cut a bone of an equal thickness all thro' at ye same time. We proceed then slowly (directing ye saw according to ye situation of ye ridges, & you are to observe that ye lateral sinuses are placed nearly upon ye inner side of ye ridge, that separates ye smooth part of ye bone from ye part which is imprest by ye muscles. Nay I apprehend we may make ev'n deviation here, that certain parts of ye occipital bone, instead of its being properly thinned, are ye most fit for some purposes. Thus when a suppuration forms upon ye surface of ye brain, it falls down till it is stopped by ye tentorium, or avoiding ye middle, we may make an opening on one, or both sides of this bone, may we might perform ye operation; even under ye lateral sinus, subpecing ye brain beat in at ye top of ye Cerebellum, cutting ye thinner parts of ye muscles, we could have room enough to apply ye Trepan't lower than ye lateral sinuses, i.e. at

4.

y. judge formed by y. muscles.

Sect. 80

Of the Structure of y.

A Temporal Bones. The lateral sinus, after running a good way upon y. occipital bone, leaves it & goes down upon y. Temporal, at y. root of y. zygomatic process, & just within y. rad of y. meatus: but you will allow these circumstances that we ought not to put y. most perfect necessity, to apply y. lesion to y. root of y. meatus process, all we can prove by any, is to raise a suspicion but of bone, for y. sinus coming in our way, we cannot evacuate matter, Following y. Sinus further, we perceive it lodge out between y. temporal bone, & y occipital, at y. back of y. meatus process y in one of subject of it perhaps, an inch & hole, which is big enough to let in a probe & which makes a communication between y. external & internal branches, some given observing this circumstance, though y. in distance of y. ear we might form some at y. back of y. meatus process, but Apprehend that y. consequence will be y.

ye wound; whether there were to prevent exfoliation
it matters very little ye point we are now treating
but that is not owing to ye size of ye wound
at least ye odds is not so considerable, as to
merit much attention.

With regard to ye Surgical treatment
or application of ye Trepan to this bone, it may
be broke as in ye rest of ye Cranium, not only
by a stroke immediately upon it (tho this will
less frequently happen from ye bellowing
of it, & from its being covered w^th ye temporal
muscle, & by its aponeurosis: but like-
wise by fissures extending from other parts
of ye Cranium. From
this circumstance ye fracture will not so easily
exfoliate in this manner as ye temporal
bone, or ye other bones of ye head, because
ye Squamous suture is very seldom exfoliated. Still however as we have found
that in young subjects, ye sutures will
not absolutely prevent ye exfoliation of fracture, this sometimes happens, I have
seen two instances of it, one of them
was ye late Mr Lauder Surgeon in

Leith

Town, he fell from his Horse, & y. stroke was
given upon y. parietal bone, & y. stroke of
lenoce as far as y. foramen magnum
occipitis, & a portion of y. Brain was discov-
ered on y. Cloth which was applied to y. head
& yet y. skin was quite entire, & weekly
learned y. reason of this upon dissection
we found y. fissure of fending thro' y. os
petrosum, & yt. y. brain had got out at
y. ear, y. membrane of y. drum having
burst, & I found yt. y. same thing had
happened in another Case. But there is
a third way in which a fracture may
happen, & which is proper to this bone
it was first taken notice of by Petit, in
his edition of Palfyns Anatomy viz. yt
when a blow is given to y. parietal, y.
punctum is not broke, y. arch yielding
but y. sides by being pushed outwards
may break y. inward scale of the tem-
poral bone. 'Tis necessary you know
y. a bridge should have abutments, viz.
be confined at y. sides. he mentions
a Case of y. kind, & I apprehend, after
seeing

seeing y^t a wound in him y^t a(ny) whith
mil^t. amiss my thinking ym not bee
in this kind, tho' y^t person who made, or rather
Simulated it, had no such Des^n, or y^t temporis
bone may be broke in 3 different ways. One
we then to follow Surgeons, who dissuade
no altogether from applying y^t trepan here:
Suppose bone not, may this rule have been
layd down upon y^t groundless apprehension
y^t a wound in y^t Temples is attended w^th
y^t utmost danger, on account of y^t tendon w^ch
covers y^t temporal muscle, Now tho' we
were to admit that great danger attends
wounds of Tendons, still greater danger
attends a wound of y^t Brain, from a piece
of bone drove in upon it, But we may use
great freedom w^th tendons, I have caused
operations to be done at different times by
cutting y^t tendon, in one case, two diff^t
rent pieces of bone were cut out here, &
therefore whenever y^t bone is broke, &c,
portion depressed, let us follow y^t example
of y^t fracture by Incision, & endeavour to
raise it. There is no (danger) ballance volum y^t
non Tumen
danger

danger of neglecting & of performing y. operation. We next proceed to y. . .

Sphenoid Bone, & after that y. Ethmoid Bone. It is obd. that y. Sphenoid bone can almost never become y. subject of surgical operations, unless where excrescencies grow out from y. lower part of it, over y. throat, & which are in danger of exploding that it, & falling in upon y. medullary part of y. brain. But as many of y. principal vessels & nerves of y. body pass that bone, & as it seems principal part of y. nose it merits your particular consideration.

Sect: 11th.

To compleat y. description of y. Cranium it only remains for you to show you y.

Ethmoid Bone. From what I have shown of this bone at present, there is little room for making remarks for except y. Cribriform lamella, y. whole is concerned in forming y. nose, & I need entering upon y. consideration of y. use of this part, for y. same reasons that did not speak of y. Frontal, & Sphenoidal

middal sinuses, which I am to consider fully afterwards.

Having shewn all y^e parts of y^e Cranium, we shall review it, in order to make y^e situation of y^e vessels & y^e nerves more evident.

I think it necessary to repeat all y^e Cautions y^t I have given, when we are about to apply y^e trepan, we have seen dangers from y^e unequal thickness of y^e bones 2 from y^e bridges of y^e bones 3 from y^e situation of y^e frontal sinuses 4 as also from y^e vessels called sinuses, & which convey blood immediately in^t in y^e bone; & we have taken notice of other dangers, which arise from age constitution & disease.

Now y^e valve of descending y^e falx of y^e Brain in diseased bodies, I think it better to divide it into 3 lobes, as is usually done, than w^t Dr Haller to section two only, calling y^e two low y^e processes, & we really divide y^e processes before & behind, & we find y^e anterior lobe divided from y^e middle one

in my d[ecease] in y. Sphenoid bone & that
that y. temporal bone there is a cavity for
which lodges y. middle lobe. it is of that
consequence to observe y. y. cavities for
medial sinus is determined more by one
piece than by y. other. for y. Semilunar is over
still being determined by y. other side in
general these lateral sinuses are nearly
equal. 6)

Sect. 12th

We next consider y. upper Jaw. Here we find 13
bones in all, y. 12 commonly described, & two
lately discovered by Berlin & Nuhnes, w[ch]
are frequently found growing to y. Sphenoid
bone, & as it was found making a part of this
bone, it was overlooked by former Anatomists. Some Anatomists from observing
y. situation of y. palate bone, finding to
plain, what is true in practice, that sinuses, y. Nonreal for instance, often affecting y. palate, readily fall upon y. orbit.
But rather than attribute this to y. extent
of y. parietal bone, we are to look for a
[illegible] of y. membrane, or of y. bone

For

for we find that certain membranes, & bones more readily affected by diseases than others one fixing upon ye hardest parts of bone, while others affect ye softer, With regard to ye 4th spongious turbinate inferiora, there is a mistake commonly committed in describing ye manner of its connexion, & a curious part of its structure is overlooked. Albinus indeed in his latter tables of ye Bones, seems to be aware of its true structure. Portal of these being merely tied to ye nose by ye membrane in ye young subject, & appearing to it in ye old subject, we find that there is a hook by which they hang upon ye edge of ye Antrum maxillare. In a young subject ye Nasus is composed of two plates, which are separated at some distance from each other. Siculand has taken it into his head to deny this, but he is quite mistaken. By use indeed, & ye pressure of ye air, whether we respire or inspire, these are drawn together, & at last grow together inseparably, so in ye Cranium, so there we find a considerable number of bones,

(by

by which means yt. ossification, beginning at a number of points at once, is sooner completed, & this irregular shape formed, and this was yt. more necessary here, as yt. bones want a mold on which to form, except directing yt. progress of their fibres, such as yt. Cranium finds in yt. Brain, the rising of yt. bones here, not to mention yt. purpose which yt. Sinuses serve wt. respect to yt. Voice, protects yt. orbits, & by yt. greater extent gives room for yt. insertion of yt. necessary muscles, which are very numerous, & at yt. same time allows properly yt. circulation of these, we find too yt. yt. circumference of yt. Skull is formed of such hard bone, while yt. under & thin bones are only found towards yt. inner part, where they are sufficiently protected against common accidents, if we look into yt. orbit & consider its shape, we may remark a circumstance, of which you will understand yt. application afterwards, yt. yt. outer side of yt. orbit is placed very slanting, whilst yt. inner side appears a great deal straighter

§ it is all ye same line (as per, by which means
ye sphere of vision is increased, as further
shewn that ye inner visions of an orbit, are
seen to be almost parallel to each other:
we shall find ye ye part at which ye optic
nerve enters is insensible to objects, but as
ye two eyes can never be directed to ye very
same point, a person who has ye right hand
both, never loses any object, we also find
that ye foramina optica are at ye inner
ext. ball for this purpose, ye nerve enters
near to ye nose, so that we are not able
to see at once both foramina optica, & there
fore no object can fall upon both at ye
same instant.

Lect: 13th

We next attend to ye parts of ye
Sclerotica, Cornea We attend particularly
to ye place of ye connexion of ye tunica sclerotica
& ye motion, first how seen, supposed
ye ye Condyle adequation near ye hollow
of ye Temporal bone, than it does in reality,
it being only lodged in ye fore edge
of ye hollow, & ye zygomatic ligament
including

including but ye half of ye hollow, w^ch ye top
of ye root of ye Zygomatic process, & ye
hollow ye hollow, & root of ye process, & ye
Condyle of ye jaw have an articular Cartilage,
ge, which divides ye Capsular ligament
into two parts, one including ye Zygomatic
process & ye other ye Condyle, shewing in what
manner does ye jaw move? many have
supposed yt it move in ye hollow, &
ye ye Condyle in ye time of motion, but
instead of that, when we open our mouth
ye Condyle of ye jaw comes forwards upon
ye root of ye Zygomatic process, & down
wards at ye same time, & suppose yt
I mean to turn ye jaw to a side, suppose
ye right, I allow ye left Condyle to
remain on ye root of ye Zygomatic pro
cess, & push back ye right into ye
hollow, & in shewing we perform two
very complex kinds of motion, & ye
next consequence to attend to ye motion.
I have now described, or to describe yt
ye axis of ye motion is not in ye Condyle
but lower than it, Thus suppose a

wire

mine to be perfect that y. head of y. condyle is
process, & y. jaw to be move upon that upon
y. condyle moves upon this joint, y. jaw is
dislocate.

And y. application of this is we may not
to y. luxation, y. jaw, which I have in
several times, it occurs that this happens
most readily, when we y. mouth open &
person receives a blow, or when a very unpleas-
ded motion, yawning, & opening y. mouth
very wide is made. Now, we explain this
very readily, y. Jaw, is then in a most pre-
carious situation, standing upon y. top of
a convex eminence, & supposed a little
given to y. chin, y. condyles readily slip
forwards, Another fact discovered by Surgeon
is, y. when we attempt to reduce y. luxa-
tion of y. Jaw, we are not merely to
push y. condyles back, but we must first
push, y. jaw down, & bring it likewise
forwards a little. The common opinion
& reason given for that is, y. t. y. coronoid
process catches y. Arcade bone, & this
appears probable in some degree, when

we

we look only at ye Skeleton but from ye attachment of ye temporal muscle, ye common process can't pass in that manner over ye cheek bone, nay I think that I can put ye point of my finger between ye common process and cheek bone, but ye back of ye condyle and then ye fore part of ye zygomatic process. So in order to disengage it, we must draw ye jaw forwards a little & downwards, before we attempt to push it back, & even in wasting persons, in order to this, & to reduce ye bone it becomes necessary yt. ye surgeon should employ his whole strength upon yt. side, & ye one condyle follows ye other.

After shewing ye structure of ye jaws following ye order of ye Dept., I shewed enter upon ye structure of ye teeth, but I am at present only to mention a few of ye most obvious circumstances wt. regard to them, as ye same objection lies against ye full consideration of them here, as against treating of ye bones in general that it leads to very minute enquiries

I shall proceed to explain as well as necessary

more parts part of y^e Anatomy, wch y^e structure of y^e bones, & of y^e Cartilages, which are seen in y^e Throat, The the Epiglottis, & y^e Cartilages serue to support y^e tongue, which could not well stand upon them, but that you may consider them as seuers to which y^e muscles are fixed, & by y^e motion of which y^e parts of y^e throat are regulated, Here we find that as y^e tongue makes y^e fore part of y^e pharynx, y^e back of y^e pharynx must be tied to y^e Vertebræ, so that if y^e tongue is drawn forwards, when we are about to swallow, y^e Pharynx is dilated, & opened for y^e reception of y^e food & in order to push it down, we pull y^e tongue back, which assists its muscular fibres, & y^e Contraction being determined downwards, y^e food is thrown w^t force into y^e Oesophagus. The Cartilages of y^e tongue serue also to prevent y^e air from being intercepted from passing from y^e nose downwards, it falls perpendicularly down thro' y^e tongue, while y^e epiglottis hinders the

food

food or drink from falling into it; which is more than sufficient to cover it, that you will find y^e contrary asserted in Boerhaave's Institutions. I shall afterwards also show you y^t y^e Voice is formed in y^e Larynx. There are two cords or ligaments extended between y^e thyroid Cartilage, & y^e arytenoid Cartilages, & they make a triangular opening, y^e Basis of which can shut at pleasure, by bringing together y^e Arytenoid Cartilages. So these Cartilages can be so influenced as to give different degrees of tension to these ligaments, & it is in this way y^t we form y^e voice, & increase y^e strength of it at pleasure. If these ligaments are relaxed, & at y^e same time separated, we have a low flat sound if again they are stretched, & brought near together, we have an acute sound, so by varying y^e tension of y^e ligaments, y^e size of y^e opening, we have all y^e advantages of y^e several wind & stringed Instruments

( )

Hal: M

Having now finished ye shaking of ye head & of ye throat which is more immediately connected wt it, we proceed to examine ye structure of ye

Trunk & first of ye Spine. The method of making ye remarks wt ye Denomination I shall confine myself much to Denomination which method tho less entertaining, will be more distinct here, as my Observations will be better understood, after ye several pieces, & their motions have been fully considered.

Sect: 55

Now that we have seen all ye material parts of ye structure, I shall endeavour to explain ye use of each part, & to draw such consequences as may seem useful from it.

We consider ye spine as serving 1st as ye pillar which supports ye head & ye trunk of ye body. 2d it lodges & protects ye principal nerve, ye spinal marrow conducts it safely to ye place of its Destination, & lastly shows ye number of joints

pile, it was to give as much spring & strength to the whole, as was consistent with a proper thinness, we have seen the bones of the Vertebra are considerable strength & breadth but to add regularity & ease to the whole we find that the Vertebræ likewise touch behind & are connected by the oblique processes, to broad ends of the bodies, whilst it leaves room & space for the Marrow, likewise gives opportunity for a firmer connexion, giving more room for the intervertebral connecting medium, the Cartilage, the connexion is easier, & the bodies are protected by other bones by the muscles by the Bowels, We find nature every where endeavouring to save us of the unnecessary load of bone, has formed these spongy ex cepting only the thin plate at the circumference, & the epiphyses upon that which are more immediately exposed to pressure but behind we find the processes made of very hard bone, as they are much more exposed to injury; & want the soft Cartilaginous substance between them, being only tipped with Cartilage, & tied by liga-

ments

muscles, as we they sustain a greater shock, there is a necessity for their sibulance being more violent, & y. previous part we find y. long processes, y. spinal & y. transverse. We consider these first as nothing superior to y. spinal marrow, but more especially y. spinal processes, which are in general placed in a slanting direction, as y. pointed instrument is prevented from entering between them. Hence more danger attends wounds of y. neck, than of y. back only particularly about y. last of y. neck, where a considerable space is left between y. processes, which are almost perpendicular, so if it is y. custom in some countries to kill cattle by pulling a pointed instrument between y. occiput & first vertebra, or between y. first & 2d vertebra. But besides you are to view them as giving mobility greater as surface for y. connexion of y. necessary muscles, but as altering their direction, & which is of still further moment, y. muscles are enabled to act more powerfully on y. trunk,

acting

time w^ch a body of a certain solid length, to w^ch you have seen of y^e internal lateral Ligaments, indeed you made to depend upon a spiral y^e Cube of motion, but by shewing you y^e nature of a pendulum, Animal, it is evident that y^e motion is performed upon y^e very center of y^e body of y^e pendulum, you have made y^e Cubitage, there is a Ball & socket w^ch a Capsular Ligament, we find this not common in y^e structure of some fish in y^e whale, where there is an intermediate y^e substance, my Father in y^e Medical Transactions has described a very curious structure, y^e motion is performed on a Ball in y^e very middle of an intermediate substance, but in y^e middle part inclosed being much harder he found a cavity filled w^th mucus, or a fluid having little compressibility, which serves as y^e point on which y^e whole turns, & y^e motion is made in that way w^ch a large stocks, turns on a more solid body, & seeing now y^e structure of y^e human Cubitage, we find y^t y^e edge of y^e intermediate pul-

plane

stance in hardness, so that if a middle or more part should nearly of same pressure as the whole. There is still another use of the interstitial substance, which is usually assigned to by Authors, viz. when we enter into a motion of the body forwards, and the manner is considerably lessened the (cube), or spirit of motion; if you were to suppose the bones merely lessened with cartilage, or nothing placed between that would yield considerably to spinal manner, in making such a flexion would have been drawn out to a much greater length, than when the column is pressed perpendicularly. But by the interposition of a substance like cork, which yields in the manner, when the weight is thrown forwards, this substance is compressed as the whole column made shorter, & the overstretching of the spinal marrow, there by prevented, with the like view we find the motion divided among a number of joints, so that each yields but a little, a sufficient flexion can be performed, while no one part of the spine is strained.

distance in a certain degree [illegible]
most part, where the spinal marrow is wholly
lost it is known under the name of the greater
spinal marrow after it is divided into
a great number of different vertebræ.

When we view the whole (when connected together) we readily explain that it is cylindrical, & the breadth of the
is continually increasing, we [illegible] with
with greater security, or if we [illegible] a cylindrical a pillar of stone, we would [illegible]
shape somewhat resembling this, we can
see a farther reason for this, when it
receive a motion, the weight of the part acts
with more advantage upon the neck than
upon the top of the spine, suppose the head
alone was supported by it, upon making
a stepion, we would be more in danger
of drawing asunder the lowermost parts
& the weight is continually increasing, so
a greater breadth is necessary, to give
room for a greater number of ligaments
tons & cartilaginous fibres, in general

we

me proposes w^t every Class of worlds y^t y^e, are
seperated, in every direction, for y^e Earth
goes yield in all directions, so as even to the
y^e Central Worlds endeavors, that not so
much as those of y^e next in bigness, & y^e clan-
sicly have an excentric effect, upon making
a sudden motion, it disposes y^e whole, him-
self y^e body from ascending tarquietly, &
after to in raising it again, me gather proje-
ction w^t every point of y^e spine, y^e power
of twisting y^e body, but we exercise this
power most readily at y^e top of y^e neck,
by turning of y^e Structure, & y^e
motions, y^t are performed, we am not to
attend to very small, y^t account for cer-
tain diseases, to which y^e spine is more
immediately exposed, you have seen y^t
y^e whole weight of our body is sustained
on an elastic compressible substance
which I have compared to Earth, & y^e Thicks
ness of that, supposing all y^e Cartilages
joined together is very considerable, may
bring a 4th or 5th part of y^e whole length
of y^e spine, it must readily occur to

you

you therefore that in general persons, we are continually living of our height, that we should in a manner there in growing. however may evident that you such signs of their long age are rather hypothetical, it may give more honour not long age, by more accidental by a Gentleman in England, he shall we love from 5ft inch to 6 whole inch, more or less, according to y^r age, constitution, & especially y^r length of y^r person. Tall young people love mostly an inch, but in general y^r less is more 5ft or 38 of an inch, the whole tho, or mostly so, is in y^r earlier not in y^r latter part, not in y^r succession for y^r person loves as much willing, or standing, & a horse loves nothing from y^r horizontal situation of his spine, for he has every Gentleman may love a some what in y^r common joints, but y^r be so inconsiderable y^t we do not observe it.

Now from this you will understand y^r reason of what frequently happens y^r elderly people stoop forwards, hence forwards

forwards naturally. This is a natural change, ye Cartilages gradually grow thinner, & gett more consumed & yield more than ye processes below, so yt at length ye head comes to be bended forwards.

This leads us yet further, first ye bones being forwards by a natural change, & that a person in a single day loses considerably of his stature, whenever from any decay or accident, ye body is thrown off its proper basis, or ballance, one part of ye spine comes to be consumed, ye Cartilages grow more thinner on yt side, whilst ye other on has its juice drawn out, & by ye body being kept in this situation, it acquires an unequal growth, & hence Curvatures are very readily formed, & we often observe Curvatures of ye spine from wrong posture, where there was no such disease as is said to produce acrimony in ye humours, & to occasion swelling & Inflammation in consequence of that. So under ye head of changes made by ye Lues Venerea, Scrophula, rickets &c. ye spine

spine may be owing from any cause, which keeps the body too leaning over to one side. In like manner if our body is wrong set upon a bias on one side, or if from any misfortune one of the legs is shorter than the other, & no means are taken to support the body equally the same effect may be produced, or a person may bring on complaint by a wrong habit in sitting. So far I apprehend is perfectly evident, but let us survey this, you see here a crooked spine, where the shape of the several pieces is altered. Now you find the curvature in more than one direction, or there are more than one curvature, suppose that habit, or any other circumstance induced this person to bend over to the right side, the curvature increased from time to time this intention, the body falls over more, a luxuriant growth takes place on the other side, this body then lay (a great deal too much thrown off the common basis, & he endeavours to remedy this by an unnatural curvature, to throw the centre of gravity between the legs. Hence you almost never

and ye triangle curvature, then ye change
be sometimes regular number, but still ye
general weight falls upon ye vacuum, upon
ye false Vertebra between ye legs. In some cases
ye find ye edge of ye Vertebra all round entirely
obliterated, so that one Vertebra comes to touch
ye 4th or 5th beneath it, nothing seen of
other side, & this is ye plain reason why
people who are created in ye spine, diminish
much more in their stature by age than others
A person who is remarkable for being little
when young, is much more so when old, ye
curvature continually increasing.

Now, in such cases, what kind
of Exercise, or method of Cure is to be attempt-
ed? If ye person is afflicted wth any known
disposition of ye humours, as wth ye Cure
venerea, Scrophula, rickets &c the begin
wth ye proper medicines for removing those
disorders, & those being supposed eradica-
ted, we attempt by machinery to counte-
ract ye Curvature. But wth what pros-
pect of success is this to be done, if
you look into our Dept books, you will
find

find two or 3 different examples, where y. Curvature was contracted by very simple circumstances in y. beginning. My Father once to mention y. case of a Boy, who had one side contracted, by leaning too much over y. arm of a Chair at y. side of a fire, after a Pleurisie illness. The Cure here was obvious, it was only necessary to place y. Chair on y. opposite side. In a second case a Girl was contracted a Curvature by being in y. habit of sewing at a stool, in doing which one shoulder was constantly kept above, & y. other beneath & it was encouraged by y. Girl's continuing to rest her sewing on y. other hand, & placing her head in y. opposite situation. In a 3d case a habit was contracted by sewing in y. ordinary way. But not withstanding y. encouragement from such causes, & y. prospect of succeeding above y. Curvature is perfectly recent, yet if it has continued any length of time, & was made sideways, (for if from a habit) or from a complaint, a person is obliged to lean long forwards, or backwards, it would be more hard of making above. How well see y. wrong carriage in Girls, in every

very (duly corrected by wearing a collar) & more es-
pecially if it has continued so long, y^t the spinal
curvature is counteracted by the formation of
a second, we should be cautious in stemming
a progress, as it is impossible to apply any
thing so powerful in many degree of
exactness.

Lastly let us consider y^t change, y^t may
be made in luxation of the spine, when y^e
very close connexion & adhesion of y^e several
pieces to each other, it is evident that, exclu-
sively of y^e internal pieces, they cannot be se-
parated unless by very great force; & there-
fore we can scarcely suppose a total and
complete separation to take place, without
material injury being done to y^e spinal
marrow, for it is scarcely possible y^t a com-
plete luxation can take place without such
an affection of y^e spinal marrow as must
prove fatal. In any form of y^e dislocation of y^e
connexion, you will find many instan-
ces of luxation of y^e spine in Sulzer's
Abridged German Writers has been at
a good deal of pains upon this subject, &

he

he has only been able to collect two or three such instances. I have seen one instance of a compleat luxation in y^e^ neck, which proved fatal tho' upon examining y^e^ body very carefully I was not able to distinguish certainly a laesion in y^e^ spinal marrow, therefore that y^e^ common effect will be a laceration of the fibres, we are not to take this w^t^ exception (See Medical Communications Vol. I p. 144) In such a case we endeavour in y^e^ common way to stretch y^e^ parts, & to keep them in their proper situation by means of a piece of pasteboard, which has been rolled in water, & in y^e^ way give y^e^ patient all y^e^ chance he can possibly have. But tho' we can scarce imagine a compleate dislocation of the spine y^t^ is curable, yet we may conceive a dislocation of y^e^ oblique processes, of which y^e^ one may readily slip off from y^e^ other, & be entangled by it, suppose y^e^ person leans forwards, beside his body over any round substance, & that in this posture he receives a violent blow, which increases y^e^ flexion in this

this case, we in their luxations of ligaments
may be lacerated & ye edge of ye one process may
catch ye edge of ye other, so yt ye person
attempting to raise himself, finds it difficult or impossible, nay can ye patient be restored even w.t assistance. Now how are we
to perform a Cure in such Cases? some have
directed ye patient to be laid upon his Belly
& a great bar of Iron laid across ye back,
ye process to be thrust in by force, but in
this way we do not disengage ye process, we
only lacerate ye Bones, & may wound ye
neighbouring parts, We are rather therefore to
follow the specialer Relief & endeavour
to reduce ye process first, by moderating
ye Action, by bending ye body more, &
by laying it across any round substance
& then to raise ye patient bodily, ye
Surgeon endeavouring w.t his hand to
push ye Bone back into its place.

Sect: 16th

When speaking of ye Luxations of ye spine, we
put entirely out of ye question, ye Luxations
yt may happen more readily at ye top of

ye

yt. neck when ye. luxation is particular ye.
can nearly judge how yt. may in which ye. luxation
will ye. most readily happen to us. We find a
case of this kind thus described by Petit.
A man listed a Boy from ye. Cricket by ye. head
on telling him go he was found dead immediately
& he died in a few minutes, ye. Boy had slipped
glided at first, there was no dislocation, but it
is probable yt. by ye. weight of ye. Body, ye.
2d. Vertebra was drawn away from ye.
first, that ye. perpendicular ligament wch.
ties ye. point of ye. tooth like process to ye. head
had been much relaped or lacerated, so yt.
ye. point came to be lower than ye. transverse
ligament, which prevents ye motion back-
wards upon ye. medulla & perhaps by ye.
struggle, this perpendicular ligament
being torn, & ye. other relaped, ye. oblique
processes of ye. second vertebra might have
slipped off from ye. oblique processes of ye.
first, I shall now find a few examples in
Authors, where luxations have happened
here by a fall, ye. second vertebra slipping
off from ye. first, & compressing ye. spinal
marrow

manner as even leaving it.

How in such a case what method are we to take for y. reduction? Suppose to me y. case will be this. We do not hardly endeavour to push y. head back into its place, but in first place y. necessary separation, we take hold of y. head, making y. resistance wt. your knees upon y. shoulders of y. patient, stretch y. parts a little, & then give it y. proper situation. It has been alledged that such luxations have been frequently cured in this way, as in y. case of two persons of high rank in this country, they fell from Horseback, were immobile, & soon after such an attempt they recovered. Now y. only question is whether they would not have recovered whether y. attempt has been made or not, that from y. fall they were stunned, as in y. case of a blow upon y. head. The way to judge in such a case is to try y motion of y. head before you begin any operation, & if you can turn y. head to y. proper situation, y. patient is barely stunned, & y. operation would be hurtful but if you find a resistance from y. cal-

chings

thing of ye obliging precaution, than ye operation is altogether necessary. Want of attention to this circumstance, has made people to believe that such Luxation have been more frequent than they really are; & there is another circumstance which has led into ye same mistake

The spine is frequently said to be turned where tumours have formed on a distortion of ye body, & that owing to a spinal gouth, so that by a proper attention to ye circumstance of ye case, ye Surgeon might have made ye distinction readily. If ye tumour & distortion be owing to a Luxation, we can trace it first to some violent cause; & ye patient is neither able to raise his own body, nor can he be raised sufficiently by another, whereas a patient may be real down & ye legs become paralytic from an affection of ye Spinal marrow, tho' no Luxation has taken place, ye blow occasioning an Inflam: & ye tumour forming in consequence of this. But further these tumours occur not only independent of any external Injury, but indepen-

dent

of any (tumour) I which we can give y. name
they are often highly dangerous. I have now
seen about 10 or 12 such tumours that [illegible]
in y. spine, some of them I could trace [illegible]
a visibly constitution, in others there was
evidently a scrofulous taint, in one case there
was y. Lues Venerea but in all y. others y.
disease seemed absolutely local, y. patient
had no other complaint. Of y. number I mention
I could trace y. history only of two y. others
being only poor people, y. I saw once or twice
at y. utmost, of that number, in 3 y. cure
so proved fatal by affecting y. spinal marrow
The symptoms were at first a burning
heat & pain about y. part, before we could
well distinguish any degree of swelling
but at length y. tumour came to be very
distinguishable w.th y. hand & y. patient
suffered violent shooting pains, which
extended downwards to y. lower extremities
In some of y. cases, these pains were y.
first complaint & y. tumour was only
discovered sometime after, so y.t they
were taken for rheumatic pains

They

they increased to a most excruciating degree
so that they were not able to turn themselves
in bed, but lay for several days without attempting
y^e smallest motion. The pains were encreased
& often accompanied by a degree of sickness
then by a degree of fainting, y^e pulse became
quicker & smaller & y^e viscera indeed at
last fatally. Upon y^e cause of this assem-
bly of examining y^e body, & I found y^t y^e
spine was considerably distorted, y^e canal
for y^e spinal marrow was considerably
straitened, there was a growth & tubercles
& a manifest erosion of y bodies of y^e ver-
tebræ, & of y^e intermediate Cartilages, w^ch
were into y^e canal of y^e spinal marrow.
In another case I found no such
Compression of y^e spinal marrow as
expected, y^e canal was not so much decay-
ed, but y^e membranes & tunicles y^e bone
& y^e Spinal marrow, were considerably
thickened, & had a purple colour different
from y^e natural. Now after describing
this complaint, is there any observation
w^ch regard to y^e manner of treatment
or

in cure y^t in worth y^e making ; Formerly I
used to say, that I had tried different sorts
of medicines, where I suspected any subtle, I
have tried Crocus of Mercury w^t nothing pre-
paring & y^e last ; I need say nothing of y^e Mer-
curial diseases, where y^e Mercury was indica-
ted. In other cases where only y^e tumor affec-
cted, I tried y^e Cicuta alone, or joined w^t
Mercury, & I used to say y^t y^e Mercury seemed
to have more effect than any other medicine.
I have since had an opportunity of pursuing y^e
Mercury still farther in every remarkable
case of y^e kind which I attended w^t. In these
The Man was about 40 well made & healthy
he observed y^e tumour about 20 months be-
fore we saw him, & y^e disease had come
to such a height, that he was even afraid
to stir his arm in Bed. Besides y^e me-
dicines I have mentioned in every one of
these cases, a topical discharge was made
by leeches, blisters, or Seton put in para-
llel to y^e spine. Now y^e 2^d or 3^d week
after he began y^e Mercury, there
was no sensible amendment, but continu-
ing

ing to treat him as if it had been a Venereal
case. ye. Symptoms began to abate, & in about
10 weeks ye. symptoms went all off, only ye.
tumour remained distinguishable, but not
so big as before, as a proof of his amendment
he went homewards to Glasgow, in one day
& continued well for several months, I have
had a letter from him lately informing ye.
ye pain have returned, so I propose again
to try ye. mercury. It seems therefore to be
more worth while to push this than any
other yet known medicine. Having now thus
fully examined ye. structure of ye. bone, we
proceed to ye.

NB he did

False Vertebra. It is necessary
once to remark, that there is ye. utmost
variety in ye. appearance of ye. spinal process
of ye. false vertebræ, or Os sacrum, In ge-
neral we find ye. they gradually grow
shorter, as if they had been long they
would have pressed upon ye. part to
in sitting down, & ye. last nerves are
only covered by tough membranes, in-
stead of bone. So that in all persons
wounds

mundo wt. sharpe pointed Instruments must
to ye end yt ye vacuum may be attended wt
very dangerous consequences, & it happens
not unfrequently yt ye opening (done
y most deal farther up than usual, there
being in some cases two, & in others only one
spinal process. & in ye Os sacrum of a young
subject which I have seen, ye spinal marrow
now in open ye whole length of ye sacrum
except ye uppermost piece, ye 3 piece
composing each Vertebra running together
sooner than ye different pieces in each
other —

In this circumstance of ye opening
in ye Os sacrum, leads me to speak of a di-
vision in which ye whole spine is concern-
ed, but particularly ye lower part of
it, viz. ye Spina bifida, so called from
ye Spinal processes being slit into two
parts. The fact is that tumours form
in ye back & lowest part of ye spine
about ye top of ye Os sacrum. These
contain a fluid, & communicate wth
ye cavity of ye Spinal marrow, & they

have

seem merely a soft covering, as there is a want of ye spinal processes. I have examined these tumours in the subjects by dissection & ye appearance of ye Complaint is very particular. It is generally seen w^t. ye, but ye tumour often birth increases quickly, & ye colour is different from that of ye rest of ye Integuments, it is of a brown colour, like ye circle round ye nipple of a Negroe, & ye skin is much thinner at first, then in ye end it inflames, & ulcerates, & becomes more opaque. The skin & membranous tumour contains at first water, as that nipped w^t. skin, but by ye obstruction, & urin inflames, is eroded & puss is formed. Now w^t. regard to ye nature of ye Complaint, I have also seen ye head dissected & knows that there is a Lymph that covers ye outer surface of ye pia mater & that of ye Cerebrum there is a passage from ye head into ye spine, between ye external sheath made by ye Dura mater & ye internal covering of ye pia mater will conceive that a Dropsy upon ye outer

other side of ye Brain may fall down on ye Spina
& we have some instances of this kind happen.
But I would observe two things further, first
in almost every case I have seen, I had no
reason to suspect Hydrocephalus, in ye two
cases I dissected ye tumour was confined to ye
part, & had no communication w^t^ ye ventricles
of ye spine, & in both ye cases ye water was
collected, not in ye backs of ye spinal marrow
between it & ye bones, but towards ye forepart
so that ye Cord was pushed out, & it made ye
backs of ye tumour w^t^ ye tegumento, so we
should be very cautious how we attempt to
treat such tumours, neither can we hope to
succeed, for, as when we take off pressure from
ye Brain or cerebellum suddenly, there is a
danger from ye vessels of that pressure, ye
case is ye same here, then ye Inflammation
necessarily succeeds ye letting in of ye air
& you are to attend to ye immediate dangers
arising from ye situation of ye spinal
marrow, that ye Surgeon by his puncture
may pass directly in upon this substance
may generally where ye tumour has broke

of

sibly if pulvis hard after mid, as shd
said we must as possible if opening into vaste
humours. We must proceed to consider if the wayes
in, & those it brings connected by fraum be
low. wh. if Spinal marrow proved. Seats of
those bones have certain signes & notes
but if principal part of ye motion in ye
ye B bad pieces upon ye sacral; in ye other sic as
it becomes lefs, & in obscure persons it remains
plebly effected sometimes. Sometimes in
is certainty of some little use in delivery. &c
Smellie indeed tries to prove that ye motion
of these is of no use because Women have been
safely delivered, & easily, where ye coccyx
gio was found to be completely ossified, but
il only follows from this that ye pelvis may
otherwise large enough, & surely as this
part performs motion, ito yielding bones
must be of considerable use, & where ye
pelvis is narrow, & this part is ossified
it must render ye labour somewhat difficult.

Lect. 17

As ye False Vertebræ we must add ye two bones

bones, commonly distinguished by ye name of
ossa innominata, i.e. their figure is so irregular
that Anatomists not finding any common name
to call them by have called them
ye bones w^ch (as y^r name) we may perhaps com-
pare them to our figure of 8. But when you
take ye description of ye parts of them, You
will find (besides their common rule)
regarding ye appearance of ye Bones only
in their most perfect state, viz. as they
do they occur in a young subject, where y^e
ossification begins in 3 places, so they call
them ye ossa ilia, ossa ischia, ossa pubis
this division into 3 parts generally con-
tinues till about 14 or 15 years of age
& sometimes much longer. The socket for
ye thigh bone, or acetabulum is composed
of these 3 bones, ye Ilium & Ischium
from each about 2/5 of ye Cavity, & ye remain-
ing 1/5 is formed by ye os pubis.

Sect: 18

After having ye general structure of ye
pelvis, we are prepared for making ye
comparison of ye male & female skeleton

After

Nor allthó we remark (diffe[illegible] in all y[e] bones
yet those which chiefly merit our attention
as admitting of application in practice, are those
y[e] skelton.

In Women are more variously, & more
(usually by Law of nature) prevented from being equally
active w[th] Men, we find y[t] y[e] texture of y[e]
body in every inferior member, how less strength
firmness, & toughness in y[e] several parts. May
we observe that not only y[e] body is shorter
as y[e] several pieces shorter, but smaller in
y[e] proportion. And, as we shall afterwards find
y[t] proper condemnation of bones, promotes y[e]
ossification, & y[t] it not only promotes y[e] beginning
of it, but y[e] extent of it, so y[t] we more
frequently find unusual openings between
y[e] different pieces of bone in Women than
in Men, hence pursuing y[e] same method
y[e] sutures of y[e] Cranium in Men, are
seldom obliterated, so that y[e] Ancients who
were quick, when speaking of y[e] sutures
are more to be alluded to. On y[e] same
account from y[e] weakness of y[e] muscles
their small degree of action, y[e] prominences
of

yᵉ bones are better seen in yᵉ male, so that
when we want to paint out yᵉ origin & insertion
of yᵉ muscles, we prefer yᵉ male to yᵉ female
Skeleton, & where yᵉ muscles have an effect
in drawing yᵉ ends of any bone nearer to each
other, we observe that effect better in yᵉ male
& viewing yᵉ heart as a muscle, we are led
to another observation, that yᵉ points made
by yᵉ blood vessels upon yᵉ bones are less ob-
served in Women, while yᵉ arteries in them
sink deeper, which renders yᵉ danger of
wounding greater in Men than in Women
but yᵉ chief difference to be attended to
relates to yᵉ pelvis, or to yᵉ bones so formed
for yᵉ propagation of Children, to which we
might mention a remark made by my self
& which appears highly probable, tho I
have never examined it that yᵉ thorax in
deeper, yᵉ distance between yᵉ heart
breast is greater, so yᵗ when yᵉ motion
of yᵉ Diaphragm by yᵉ dilatation of yᵉ
Uterus is confined, a small part of yᵉ
ribs have more effect in enlarging yᵉ
Cavity of yᵉ Thorax, & they allodge yᵗ

we

we are not deceived here by y. size of y. manna

Let us now then allow very greatly to y. shape of y. Pelvis & y. size in y. two sexes shall alledged in a general way that y. bones are smaller in all their dimensions, that y. diameter is less as well as y. length, but here we find a manifest exception to y. rule, & which y. Salvarian & painters have long ago remarked. For w.t out regard to proportion, y. Pelvis of y. Female is larger than that of y. Male, when we compare y. shoulders w.t y. pelvis in a well made man y. proportion is nearly what y. painters suppose, y. distance between y. tops of y. shoulders to y. breadth of y. pelvis, two to two, But I doubt if these proportions in y. female are to be reversed, that y. breadth of y. pelvis is to that of y. shoulders, as three to two, y. painters seem to exaggerate here, But y. pelvis w.t out any regard to proportion is larger, as y. women take more room in sitting than Men do, & y. bulk is not owing to y. Cloaths Now let us see on what that depends.

1.st

a/ ye Pelvis, this ye must not merely
mean ye upper part betw. ye Ilium when it
is fully (evolved) but because nature does
also give a greater proportion to ye Abdomen
as well as to ye Thorax, that when ye Uterus
ascends, ye abdominal Viscera may be more
easily kept up by a slight elevation of ye
Spine. But when we attend to ye brim of
ye pelvis, we observe that when ye body is
in a sitting posture, or placed erect, ye Os
of ye pelvis is not horizontal, but obliquely
as ye Os of ye Sacrum is about 3 inches
higher than ye opposite. The brim of ye fe-
male pelvis has more of ye oval shape than
that of ye Male which is more circular
so comparing ye brim of ye pelvis in ye
two sexes, wt ye head of a Child, ye shape
in ye Female answers much more. O

We next attend to ye size, & situation
of each part, & we find ye ye two last
have been each nearly ye proportion
that ye greater Circumference (does not
does not) depend upon any particular
piece alone being longer, but ye whole

On

os sacrum is larger in women, & in like manner the distance from os sacrum to pubis is greater, & so in the recent subject, there is a remarkable difference in the thickness of the cartilages of the ligamenta-cartilaginea betwixt os sacrum & os pubis are connected.

Again at the lower part of the pelvis when we compare the two openings, the lesser is perhaps in proportion greater than it is above. For first os sacrum in women goes further back than in men it is more hollow, in men it is more inward. Next os coccygis is connected remarkably lower, it has much more motion, the cartilages are softer so that you may consider this part as away because without dissecting it, it can be pushed quite back, there is a real motion equal to 3 or 4 inch in a common delivery, I have divorced the junction of os sacrum outwards, & next you will observe the ligaments of the pubis, how very much it is larger in

in y^e female now contrary y^e effect of this ;
increasing y^e arch, y^e ossa ischia and pubis lead
to a much greater distance from y^e os sacrum
from each other ; so that from this circumstance
y^e breadth of y^e pelvis is very greatly increased, and
on y^e other hand we observe another circumstance
which is not sufficiently attended to namely
y^e greater size of y^e foramen thyroideum, or
y^e where y^e os ischium & pubis join together
they form a greater circle. And y^e cartilage
between y^e ossa pubis is thicker, & it is likewise softer & taking y^e sidewise, y^e cartilage is not so deep as in y^e male, hardly y^e
remark that y^e ossa pubis in y^e male join at
an acute angle, while in y^e female y^e angle
is much wider, very near to a right angle.
Hence upon y^e whole, y^e dimensions are considerably greater, & I repeat it that they are
greater below than they are above. -

Now must let me m^r D^r Smellie who
was y^e first perhaps, who made observations
on this particular subject, view attitude
y^e depth of pelvis, & compare y^e upper &
lower side of y^e pelvis & is plain to y^e

that y. depth of y. fetus behind is greater than at
y. side, & that at y. side it is greater than it is
before. Smellie alls. for y. y. depth behind about
6 inches, & it is manifest, upon viewing y. Uterus
in utero that, at full time, it will have y. depth
y. side, & this will be found to be about 4 inches
The reason of y. depth behind, is the more
than that, in y. protuberance or cavity in wch
it is lodged, they are as one, two, three. When we view
y. fetus, & compare y. opening below wth y.
above, there is more resemblance in y. shape
than you at first sight could well suppose
Supposing y. Os Coccygis drawn back, both
openings are oval, and somewhat of y. same
shape. Smellie wants persuade us that they
are nearly equal, but y. brim is wider than
it is below, even after y. full explosion
is made & they come near to y. same size
that not so exactly as the magnico. becomes
parts of upper & y. under side in this man-
ner, y. breadth of y. fetus, he reckons 5 3/4
inches, or there abouts. & y. depth 4 3/4 inches
Now we see very plainly, when we take
a measure, that there is more than an
inch

made in effect, by every person's eye, a very much more than smaller impression on different persons, & upon the whole his comparative view of the upper part are too small & the breadth greater than he supposes. Then he compares these w.th the parts below, & finds the distance between the point of the coccyx when pushed back, & the bottom of the ossa pubis is greater than the breadth of the tuberosities of the ossa pubis. For, the other relative superficial measures, we find the sides of the main seemingly proportionable if we add more accurately, measuring from the sides of the vide stand considerably, hence the proportions are removed, at the top the breadth is greater than the middle, at the bottom these narrower, but the proportion is one not the same from the coccyx to the ossa pubis, the distance is about 5 inches, whereas measuring transversely the distance is but 4 inches ... 6

Now upon these measures, Smellie explains the descent of the Child's head, & it in a very rational way. I shall only some

some few things to remark w.ch regard to it, which are not pointed out fully enough. A Child w.ch in ye womb have its head constantly undermost; at least as long as it is unsupported in ye waters unless by ye force of its muscles, it changes its posture, & as soon as they cease from acting ye head falls undermost. Because ye body is unsupported by any thing but ye umbilicus, & ye head being heavier falls undermost. The head then is applied to ye pelvis, & pressure is made by ye muscles of ye Abdomen, & by ye Diaphragm, & by ye valvulae of ye uterus & os in delivery, as ye Child is pushed downwards. Now ye oval shape of ye pelvis & that ye depth is much less than ye breadth ye head of ye Child cannot well pass down w.ch ye cavity of ye ossa ilia, it may happen to do so when it is small, but generally it accomodates itself to ye shape of ye pelvis. The head of ye Child measures ye brim of ye pelvis, & there is nearly a like difference between ye diameters, ye distance between ye fore & back part is about an inch more than it is between ye temples, wch entering

w.ch

m.t of care towards of Back & belly of of Mother
But when it how proceeded to of lower part of
of spine it comes to be stopped by of ossa ischia
which have a slant from above inwards. The
head now then must change its situation, &
of fact is that it changes it in this manner,
of face comes to be turned to of Os sacrum; &
of vertex appears under of ossa pubis, or of
vertex or part where of hair twins round
from a centre, is of first part that is felt: we
see then that of shape of of spine is answerable
to that situation; because of distance is greater
between of Os coccygis, & of ossa pubis, than
between of two ossa ischia. But why that does
not of face present as readily as of occiput?
that Smellie does not sufficiently point out
& this happens where of child is dead, but
perhaps more readily when it is alive, &
for this reason that of head is balanced une-
qually upon of condyles of of occipitis, or
of if a person sitting in a chair falls asleep
his head tumbles forwards, of weight brings
it down, or suppose of head to be balanced
upon of spine, a pressure is made at of

top

top; which affects ye broadest part most; & hence
ye Skin of a dead Child is pressed down upon
ye breast, & ye head from that circumstance
gets ye conical shape, or ye os occipitis is pushed
downwards, nor can it be a means in dilating ye
2/ lower part of ye pelvis. And when ye Child is in
Life, by an instinct of nature ye muscles are
in action drawing ye Skin to ye breast, as
3/ being ye most secure situation. And in this
that ye os occipitis is a round & slippery
substance, which more readily changes
its shape than ye face can possibly do,
Hence this part presents ye first, while
ye Os coccygis yields backwards, which
motion is of real & material use. 6

There is but one thing more relative
to ye pelvis, which I think necessary to point
out to you that we should now allude to
ye manner in which ye pieces are connec-
ted to each other. There is one part of ye os
sacrum yt is covered w^th cartilage, and
which answers most exactly to a surface
upon ye os ilium; & in ye recent subject
they are actually glued together; so that
after

after I have cut off the capsular ligament, I cannot draw the innominatum away from the sacrum without using considerable force, you will also observe carefully the colour of this surface, & the general shape, it is evidently not well fitted for motion, the parts being very unequal, very unlike surfaces of one bone to slide upon the other. I first remark the size of the surface there is something altogether singular in the connexion of this part, much more of the sacrum is included within the capsular ligament than ever is applied to the os innominatum. There is a space between it filled with a substance, which is altogether singular, in the connexion of this part a red fibrous matter, & there is nothing like it in the body but the two bones, tho within the ligament never touch each other, except later the os innominatum, & join it as well as I can, in order to shew the space left for the ligament. (artilaginous substance, & the bones are very rough for the firm attachment.) Now at present I cannot draw a conclusion from the structure, but must refer to an—

after

after examination of ye recent subject, we are
inclined that there can be no great degree of motion,
here w^t call a diseased, such a separation
as would be very sensibly felt after delivery
& would give great uneasiness, as we are not
w^t some accoucheurs imagine y^t ye bones
separate to any considerable distance from
each other, but we are rather to follow in this
Dr. Smellie, & believe Dr. Young who thinks
y^t ye motion is quite inconsiderable & that
where we discern a free motion, we ought to
heal it as a disease. There is no doubt a
semewhat of a relaxation from ye pressure
of ye Uterus upon ye returning blood. There
is too an irritation occasioned by ye delivery
which occasions a flow of liquors to ye part
& lastly there is ye mechanical force of ye
head, acting like a wedge against these
joints. When I was at Berlin I saw ye poli-
cy of a Woman where ye os pubis could be
made to play upon each other. But we are
to consider this as a disease, & where it
occurs we ought to deliver ye woman in
ye horizontal posture, & she ought afterwards

to

lance of the Celtic Youth.

Vol: 8th

In comparing the description of the human Skeleton, it remains that we examine the ribs which are the thorax, & containing cartilages join the dorsal Vertebræ in forming the thorax. I believe you will find it more difficult to find known the structure of it.

Thorax, which generally in the adult consists of 3 pieces. The uppermost piece in all is pretty regular in its shape, from this a good deal of figure is varied to represent a heart upon base, broad above narrow below. The shape of the middle piece varies extremely, but in general the lower part is broader than the upper. The undermost piece called from its connexion in the young subject into shape, cartilages uniform, or nearly so, not only varies in its shape, but we find it of different length. It is generally somewhat more than an inch, but in some subjects I have found it to exceed a quarter of an inch. Sometimes I have found it very short, in this case it is not cartilaginous, from

some subjects it is very much turned forwards & compleatly ossified w.th the processe above, & this is sometimes effected so soon, as when swellings are occasioned in the Belly, & it may occasion troublesome symptoms. The ossification of this part begins in a very irregular manner, in from 4 or 5 to a dozen different portions. Now this is true to observe this, because, without knowing the original structure, & the diseases, which sometimes remain long, a Surgeon might mistake these for fractures. Make the experiment

With you will attend to their head in the end of which there are two hollows, & made to a ridge, where it is joined to two Vertebræ & to the Cartilage between them ... to their tubercle, by which they are joined to the transverse processes of the dorsal Vertebræ, both here & at their head, they are not only covered w.th a Cartilage, for they have but they have a Capsular ligament to the rib touches the transverse processe of the undermost of the two Vertebræ, to which the head is connected, it remains

in

in a Cantilever position, [illegible] all
made angles w^th y^e spine, you allow to y^e fur-
row at y^e under side of y^e rib for ye tendons
& intercostal blood vessels & nerves. The
Diaphragm is pressed up on either side into
y^e middle of y^e Thorax, that y^e Crown of y^e mid
arch of y^e 11^th rib, & y^e lungs fill to ye
bottom of y^e rib & thin partition. So that if a
person receives a wound by a wound passing
across y^e Thorax, any where under y^e 11^th rib
the Instrument first enters y^e Thorax, then
wounds y^e Diaphragm, & passes into y^e abdo-
men; then on y^e opposite side passes again
into y^e Thorax, so may wound y^e bowels in
both Cavities — you know y^e general elas-
ticity of y^e Cartilages, these placed between
y^e ribs & Sternum, not only read when
bended directly, but when we attempt to
twist them, by y^e ends of y^e rib which is
joined to y^e Cartilage we find a pit which
is smooth, which leads us contrary to y^e
general opinion of Authors, to consider
these two substances as essentially diffe-
rent, may at each end of y^e Cartilage there
is

in connection of y^e appearance of a circle w^ch you may possibly come into another method of copulation of y^e rib from y^e Cartilage & of y^e Cartilage from y^e sternum.

Next you will attend to y^e situation of y^e Cartilages, & y^e direction they have, their length is not only continually increasing which is a necessary consequence of y^e obliquity of y^e ribs increasing, but y^e angle they form is necessarily changing at y^e same time, & y^e Cartilage does not run in a straight line from y^e end of y^e rib to y^e sternum, but is curved. Next you will observe that y^e lower ribs slant much more than y^e upper being all equally connected to y^e dorsal vertebræ by their head & tubercle, & these continually increasing in thickness as they descend.

In order to understand y^e motion of y^e thorax, you must attend to y^e connexion of y^e diaphragm, & intercostal muscles.

Sect: 20

We shall now consider y^e reason & y^e effect of y^e structure you have seen & mentioned

seen

veen ye head of ye rib joined to ye interverteb: & substance & to ye edges of ye vertebra, I conceive several advantages from this connexion. 1st When a blow is given to ye sternum ye shock is rejected by ye yielding Basis next ye rib plays upon ye cartilage w:h greater ease, w:h less attrition, ye motion is more smooth & equal, which was necessary, considering ye constancy of it. 2 Tho a certain degree of obliquity is required in all ye moveable ribs, ye uppermost is almost placed quite perpendicularly from ye first & ye dorsal Vertebræ but ye other come off w:h a degree of obliquity, but if ye head of ye rib was moved upon ye body of ye vertebra in what manner could it have been connected to ye transverse processe, if it had been joined to ye transverse processes of ye same vertebra it would have stood at right angles, if to ye one below, ye slant would have been equal to ye whole breadth of ye vertebra whereas at present ye slant is only equal to half ye breadth of ye vertebra. 3 Thy there is a further advantage, which is

gently

generally overlooked, viz. that by diminishing the
head of the rib to the very centre of the motion of
the vertebræ, these playing upon their centres
the rib is less carried along with the spine, than
it otherwise would have been, & that we
breathe with difficulty in the dead posture
yet the difficulty is less than if the connexion
had been immediately with the bones. 4 The con-
nexion of the rib to the transverse process
not only secures it better in its place, but
serves to regulate the motion of the rib, besides
it to possess that degree of motion, which
alone is necessary for the purpose. 5 Thirdly
after we pass the neck becomes flat &
considerably broader, nature supposing
a tolerable defence by a broad surface
to a greater defence in a smaller
place, by turning the edge inwards; &
we find no more room between them
than is necessary for allowing of their
motion. Upon the external figure of the
body we are apt to suppose that the thorax
has above is wider than it is below
owing to the projection of the bones, viz.
supposed

support yt. inferior extremities, but it begins above small, & gradually increases as yt. curvature & obliquity of yt. ribs increasing at ye same time, so yt. motion of yt. ribs is evidently more below upwards. In yt. uppermost one, yt. motion is yt. least observable, & all yt. others are pulled towards it, so suppose yt. first rib altogether fixed, yt. muscles between it & yt. second draw yt. second towards it, it being a rule that when a muscle passes between two bones which are both moveable, yt. most moveable bone only yields, & yt. motion is not divided between ye two bones. Mr. Hunter then that yt. second rib advances a certain way towards yt. first, & it naturally drags yt. 3d. etcetera wt. it, when its own muscles act, so yt. yt. motion between yt. 2d. & 3d. ribs is greater than that between yt. first & second, & hence all yt. ribs gradually in some manner in yt. degrees of obliquity, in order to allow yt. two larger motions. Next you will attend to yt. situation of yt. flat sides & one general observation will explain this yt. yt. flat sides of all yt. ribs, from above to yt. lowermost of them is directed towards

yt.

y. lungio, that they may slide & play w.t greate ease.

With regard to y. Sternum, it is entirely supported by moveable substances, upon Cartilages wch are allowed they carry y. Sternum along w.t them, If y. superior extremities were fixed by its own weight, or y. action of muscles y. ends of y. Clavicles are y. centre of motion & to allow it to give in, have found two different points one at either end of it. long intermediate space.

We next attend to y. situation of y. Cartilages & to y. length of these, y. lengths of them gradually increase as y. obliquity of ribs increasing, their ends come to be further removed from y. Sternum, Tho removed y. every one of y. Cartilages possesses a curvature, as y. we cannot waive y. ribs upwards, without increasing y. action of y. Cartilage. From what has been observed we may form some general idea of y. motion which y. parts of y. Thorax possess in our respiration.

Every solid you know may be increased in 3 dimensions or Diameters, in like manner

y. Thorax may be more longer from y. 1st to y. below, it may be more lower from y. 1st to y. other, y. ribs may be more crooked, it may be more higher, y. distance from y. sternum to y. spine may be greater. So you will find that we generally & naturally increase y. thorax in all its dimensions. For first y. partition Muscles, i. diaphragm, is also fully muscular, convex above & below by y. muscles proper to y. thorax, & to y. abdomen, we see it convex towards y. abdomen, & concave towards y. thorax & y. whole circumference of it is fixed to those that difficultly yield, & y. chief effect of y. diaphragm, is to bring y. convex surface of it lower down, & thereby to enlarge y. cavity of y. thorax, wherein it is lengthened between y. upper & lower ends. 2dly. regard to y. other dimensions, it is evident that these must depend upon y. motion of y. ribs, which we can make from their slanting direction to peek to y. spine to near a right angle, when they are pushed outwards, & y. distance increased between y. spine & sternum. In doing this you augment y. capacities between y.

of the ribs of the thorax, & their consequent motion, & the consequent motion of the ribs, directing their motion; by their elasticity they must throw them further out from the middle, & increase the diameter of the thorax from side to side, or the thorax be increased in all its directions.

As to the particular manner in which the muscles perform this office, it would be improper to enter upon their action here, but it is evident that the muscles shewn between the ribs concurr in any general motion of pulling the ribs upwards, for it is impossible to imagine, that they can have the said ribs perform a motion upwards, without the spine also drawn upwards.

Now how we shall ordinarily enlarge the thorax in these 3 ways, it's life can be continued by a partial enlargement. From accidents, & in several diseases we find the play of the diaphragm comes to be very much weakened even in pregnancy the motion of the diaphragm is less free, still more so in a dropsy, & if pain is joined to the distension, we find it still less. We can still better continue life by the action of the diaphragm, without the

action

action of y. ribs. So if y. ribs happen to be broke
independent of y. Diaphragm applied, & acted on by
y. pain in them, from acting wt. them, may they
have been found to prove not only inoffensive to
y. spine but to y. Stomach. Other are every
common case of this kind, in which almost all y.
bones of y. body have given together, that it
will readily occur to you that as soon as y. mus-
cions I have described cease, y. elasticity of y.
parts, & y. common situation of y. body make
y. ribs return to their common place. With
regard to y. Diaphragm more of a turning, some
is necessary y. diaphragm pushed on y. stom-
ach & pulled up y. which y. muscles, & their
acting, whilst y. Diaphragm is in a paralytic
state as it were, a very small force serves to
return it, as it is chiefly returned by y. mus-
cles, which contains y. bowels of y. Abdomen
& wt. respect to y. ribs y. moment y. muscles
cease from action y. elasticity of y. cartila-
ges is alone sufficient for replacing y. ribs
as y. every dead body is in a state of sup-
ination.

Now let us altogether dismiss y.

subject

subject, we would make one or two upon
y. accidents we observe, & which have proved ve
liable. Among y. distinct symptoms of y. Cartilages
mix, is mentioned by Authors ye occasioning
troublesome cough (common sign of one, But
suspect that y. cause of y. symptome is often
mistaken for since is practised in dumb
subs. it can influence y. state of y. lungs to
any considerable degree. In some few cases
indeed y. dislocation might be considerable
y. wind may be turned out, as to occasion an
easiness & may expose y. person more to injury
from y. weather. Some men's pursuit is much
precluded outwards, y. y. patient could not bear
y. weight of y. Cloaths, & in y. Medical page
we have an instance from Mauriceau latning, that
but that y. turning of the part inwards, &
its greater length, such occasion dyspnoea
&c. very much could. How this may
occasioned by a blow given, & blow had pro-
bably affected y. bowels, & y. same symptoms
would have taken place altogether indepen-
dent of y. situation of y. Cartilages enquiring
If a fracture of y. sternum happens
we

Vide Case of fractured Sternum Edr. Medical Comm.

which it seldom does, being supported in so many
different places upon an yielding Basis, & by so
big ligaments & membranes. But if violence may
break the bones must upon a certain part
& if the fracture is compleat the parts may push
over other, when it will be difficult to reduce
them. The only way to attempt it is by removing
the situation of the body, which may possibly be
the dislocation of the Vertebra by bending the body backw.
wards on a convex substance, when the patient
makes an effort with the muscles of the
abdomen, & in Ambrose Paré we have a curious
History of such a fracture being upheld in
this way. ...

Let us next suppose a fracture to happen
in a rib, which is a very common accident, what
kind of prognosis must you form of the cure
to the Cure? I apprehend you would make a
more unfavourable one than is proper, for you
shall find the ribs are easier healed than
at first sight, considering their frequent
constant motions we would suppose. But
we are to reflect upon the possibility of endan-
gering life, & the too great care of the

action

action of ye Diaphragm, & that we ne plain [illegible]
uding wth ye ribs in ye case of pain, add to this
ye Mechanical support which ye rib rec from
ye intercostal muscles, & yt ye neighbouring
ribs prevent ye ends from slipping each other
while ye intercostal muscles, like bandages
hinder it from sinking inwards, & pulling
outwards, yt Surgeon too adds ye mechanical
restraint of a Bandage, & in fact in ye
beginning in ye body are generally speaking more
easily healed, except when ye ribs are hurt in se
as to wound ye contained parts, wn ye slightest
bandage will generally speaking be sufficient
for ye purpose. It is generally recommended
pulling ye abdominal muscles, may some have
proposed to tie bells about ye abdomen, in or
der to push ye ribs outwards, but by throwing
in a quantity of Air, we increase ye Inflam
which accompanies ye fracture, & ye bandage
is altogether unnecessary, since ye intercostal
muscles are sufficient to support them.

When a Surgeon is about to make an
incision into ye Thorax, it is evident yt ye
ought to make ye Incision, at ye lower edge
of

of y. rib, as much as possible ; that y. incision should be made at y. upper edge, due to y. equal height in y. Thorax, or y. distance from y. Diaphragm, that can only be well determined when we have seen y. structure in y. recent subject :-

Sect: 25

We now proceed to examine y. Structure of y.

Extremities, for y. two next bones we meet w.th y. Clavicle & Scapula, that they seem to be common to y. trunk & y. upper extremity from their situation, complicating y. shape of y. trunk yet when we attend to their use we find that they properly belong to y. extremities, as in most quadrupeds y. Clavicles are wanting & in y. Philosophical Transactions we have a curious case by Mr. Cheselden, where y. Scapula being found to be torn away from y. body w.th a cannon ball yet y. person was able to perform y. motions necessary for y. continuation of life. The name of Clavicle, claviis, or key, is borrowed from y. Greeks, but this bone is better named from its situation Collar bone y. nature of Clavicle not being so easily understood if it is called

are united by close ligaments to the humerus
should at all times form the humerus, to alter
the direction of the tendons & to give it a free
motion, it is not so much calculated for moving the humerus, as in quadrupeds, but it is fitted
for an organ of suspension, & it serves as
an apex, on which the clavicle & whole extremity
rolls, & directs their usual motions, whilst the
scapula chiefly serves as a socket for the arm
There is a plate of moveable cartilage, interposed
between the end of the Scapula & Sternum or inside
of the, there are two cavities in this joint &
the Capsular ligament is divided by a partition
in the middle, & this structure here, as in the
lower jaw, respects friction, where the motion
is made by sliding muscles. The large vessels
& nerves, which go to the superior extremity
pass between the clavicle & first rib, so
that we can stop the flow of the blood by com-
pression here. If therefore a Surgeon has to
perform an operation high in the arm, & there
is not room between the Sternum & the left
of the humerus, by making a pressure upon
the vessels against the first rib, the blood

in the

may be possible.

The Clavicle is not only intended for a motion upwards & downwards, but it possesses a rotation. The Scapula is joined to y. Clavicle in two places. so is not calculated to move y. chief motion is rather a kind of rotation, it can be made to rest upon y. end of y. Clavicle, & from y. length of y. Clavicle very small degree of flexion & extension at y. top of y. Sternum comes to be very considerable at y. top of y. shoulder.

From y. strong ligaments that tie y. Clavicle at both ends, we must suppose y. luxations happen rarely, & they are still more rare than from that consideration we would imagine, because when such violence is applied to y. bone, as might tear y. ligament (per se) y. Clavicle breaks, as y. fracture is more frequent than y. luxation, we find examples however, where y. Clavicle has started from y. Sternum, & when y. end of it pressed forwards on y. Sternum, we can readily reduce it; neither is this situation very dangerous, but when y. end slips w.t in y. Sternum, there is

in more danger, & we can only apply force to y. part
then end to bring it back to its place.

The fractures of this bone are perhaps more
frequent than of any other in y. body. Fall not
only given way, when a blow is applied to y. mus-
cle, but it is broke from y. person falling sideways upon y. shoulder, & as there is a greater quan-
tity of spungy matter near to y. Sternum than out-
ward, y. fracture is generally near to y. top of
y. shoulder, sometimes it is so near that it
has been mistaken for a dislocation, but we eas-
ily make y. distinction, there is in both a short
neck y. shoulder falls in, wanting its support
but, in a fracture, when we perform y. natural
motions, we occasion a crepitation of y. bone
& we feel y. place rough & unequal. Now sup-
posing y. accident to happen, in what man-
ner are we to manage it, & what kind of
prognosis are we to make. Experience
& reflexion agree, y., as Bandages cannot be ap-
plied round y. bone, & as a number of fibres
respecting motion join w.t it, it must be
difficult to retain y. bone in its place, &
to keep y. ends of it from passing each other.

This

this case may be partly owing to y. want of attention in y. Surgeon, who commonly endeavours to bring y. bones straight by drawing back y. shoulder, & in this situation y. limb is kept till y. Bandages are applied, but after y. 3d. attention is paid to y. motion of y. arm, & how, unless you retain y. humerus in y. most exact manner, it must not & cannot possibly remain constantly, so often we have replaced y. bone, & applied a Compress to y. under edge and pin of y. arm to y. side, & keept it there during y. cure, may y. patient should refrain altogether from using y. hand, & a degree of attention is even necessary in y. motions of y. head. We must attend to y. state of y.

Scapula, & its structure, & we examine along with it y. upper end of y. humerus. From y. Cartilaginous state of y. head of y. Scapula at Birth, we readily understand, why luxations happen more readily in Children than in y. adult, y. Cartilage which joins y. epiphyses giving way but before we go further in considering any of y. motions we perform w.th this bone,

or,

of y^e accident to which this part may be liable it will be of use to give you some notion of y^e situation of y^e several muscles concerned.

Sect: 99.

We have examined that part of y^e humerus which is connected w^th y^e Scapula, from comparing y^e size of y^e head w^th y^e rectal it is evident that a large motion is intended here, & y^t in all directions we can name it, being it forwards or backwards & by a succession of these motions we can describe y^e circle, but at y^e same time y^e Clavicle & Scapula assist in performing this motion

The Acromion & coracoid processes are not intended for y^e play of y^e ball, but were merely for protecting y^e joint, & for hindering y^e humerus from slipping off from its place backwards, which it otherways would have most readily done, as y^t a luxation in this way cannot happen without a fracture of y^e acromion, & y^e ball is restrained by y^e end of y^e ridge of y^e Scapula, so that it is not easily pushed backwards, so y^t this luxation does not happen so frequently, as the other seems to be supposed.

When a luxation happen

pons here, y^e^ head of y^e^ humerus generally slips downwards, or downwards & a little forwards, this last situation is y^e^ most frequent one occurs in y^e^ first case, It is of use to observe y^e^ general marks for distinguishing this luxation, especially as in half a dozen cases of this kind which I have attended y^e^ Surgeons were not aware of it.

1^st^ Note y^e^ head of y^e^ bone is thrown inwards, y^e^ arm must be thrown outwards as y^e^ head passes y^e^ Glenoid cavity, y^e^ arm must be shorter, or y^e^ distance between y^e^ top of y^e^ shoulder & y^e^ bottom of y^e^ humerus is less & in general y^e^ motion of y^e^ arm will be much less free, & y^e^ patient can't readily put y^e^ hand upon y^e^ head, this is by no means an infallible mark, as it will depend upon a variety of circumstances w^ch^ respect to y^e^ state of y^e^ ligaments, y^e^ situation of y^e^ bone, y^e^ state of y^e^ muscles, & age of y^e^ patient the most certain marks still remain: and they are y^e^ following. 1^st^ There is a very great hollow to be felt under y^e^ acromion when y^e^ Surgeon places himself before

y^e^

y. patient & compares y. two shoulders, he shall see
der y. acromion of y. one scapula a little lower
under y. other a deep hollow. Lastly let him
take hold of y. patients fore arm & bend it in
such a manner as to get a lever to roll y. humerus & he will
find y. ball play under his hand, by this
pectoral muscle, as y. is all y. parts are
taken together (I do not see how it can be
well mistaken).

We observe y. y. humerus gradually
diminishes in size from y. top downwards
to beyond y. middle, so whose it is that
fracture is generally nearer to y. under end
than y. top. From y. situation of this bone, we
may make a favourable prognosis, as we
can wrap about our bandages about it,
from y. weight of y. arm y. bone is retained
in its place, as y. cure of fractures here
are more complete than in almost any oth.
part of y. body.

We next proceed to examine y. lower
part of y. humerus, & y. two bones which
compose y. fore arm. From y. clavicle articu-
lation of both y. bones of y. fore arm to y.

humerus

humerus, it is evident that we perform merely flexion & extension at this joint, we have no rotation or lateral motion. From the appearance of the connexion, it is evident that we are enabled to perform the fore arm backwards, that ligaments to give way, & bones have very slight hold of each other, & consist principally in the pulley of the trochlea. & the two bones are carried generally together upon the head of the humerus. We readily distinguish this accident by the shortness of the member, by the direction of the fore arm being altered, & bent of all by feeling behind the humerus the shape of the olecranon. In order to make the reduction, it is necessary to disengage the bones a little, either by drawing them asunder, or by moving the fore arm forwards, by which the coronoid process slides on the ulna.

On the outer side of each of the bones of the forearm, by feeling with the finger, we can distinguish the surface of the bone, so where a fracture happens, we can often discover the broken place. If both bones are broke, there can be no difficulty of distinguishing

quishing y. fracture, but if one only is broke we examine y. length of y. bones, w.t y. fingers drawn along them, if y. ulna is broke, we endeavour to bend y. arm which has more effect upon it, & observe whether there is any crackling of y. broken parts, if y. radius is broke, y. manner of distinguishing it is still more evident, upon taking y. hand & rolling it, you can make y. respiration as Surgeons speak, where one only is broke y. length is preserved by the other, which therefore affords y. cure, but we and by no means to trust to this, for notwithstanding they are apt to slip off, particularly y. radius, yet that he a rule not only to consider y. fore arm, but y. motion of y. whole hand, & y. small effect of rolling affects y. radius in particular.

In y. rolling motion which we perform w.t y. fore arm, y. ulna remains in its place immoveable, or nearly so, & for this purpose y. upper end of y. radius is nearly a compleat circle, & is hollow, so made to roll upon y. end of y. humerus, & y. side of its head plays in y. hollow of y. ulna

&

§ 1. This purpose both ye inner & outward circular ye lower one again ye radius in hollow, & ye ulna is circular, ye convex as an axis upon which ye radius turns, & both motions are regulated by very curious ligaments, which at ye same time confines ye bones to this rolling, & prevent ye separation of them.

We next enter upon ye structure of ye hand, which consists of a number of small pieces, which I have called Sphæræ in wor for want of a better name. From ye description of ye bones we readily understand ye motions they perform.

Luxations in ye wrist happen very rarely, but where they do you must be careful in distinguishing ye luxation from a sprain as in both a rolling happens frequently instantaneously. The luxation of ye finger are readily understood.

Sect: 23d.

To finish ye description of ye Skeleton, it only remains that we examine ye

Inferior Extremities, & these so very nearly resemble ye superior, yt. ye description

of

y. Thumb can be no way necessary in this case.

The two muscles have been sufficiently explained, except y. vastus which cannot be considered alone w.t y. head of y. thigh bone, from y. manner in which y. thigh bone is set on from y. ball, y. nothing of y. more common sort of y. flexion & extension of y. body of y. bone, or y. vastus to being turned much out of y. natural or perform y. most necessary motions, from y. want of bone upon y. inside of y. articulation y. lupation of this bone is most commodiously wanted & commanded, & y. foramen thyroideum is so small as to close y. head of y. thigh bone, & from its slanting direction it does this y. more readily. But y. bone may pass almost directly upwards, & may resemble a large tube in y. groin. The vastus is turned considerably inwards, for unless y. two feet are but close together a person would be under a necessity in every step of performing a very large motion, he could not lift y. one leg, till he had thrown y. weight of y. body upon y. other, whereas at present y. slightest

agitation

agitation is sufficient, & even in Women y. pelvis is considerably broader than in men. y. is liquily is greater, & Women in running lose y. body over from y. one side to y. other much more than men. The thigh bone is round before, & hollow behind, in order to lodge a greater number of muscles of y. pelvis parts, as Animals of y. thigh bone are perfectly just.

The side of y. tibia, which is turned inwards & forewards, & which is called y. shin bone, is only covered w. skin & cellular membrane, hence in y. case of fracture, we are able to trace y. tibia the whole length w. y. fingers. But it is more difficult to judge of fractures of y. fibula in this way as we have received the other marks, as y. yielding of y. leg, y. cracking of y. bones, or from considering y. particular nature of y. accident. It is of use to attend to y. direction of y. ridge upon y. tibia, as it is by means of this weight as we might conceive it, but (describes a figure resembling an Italic S. So in walking y.

y. bone when y practice, we must attend to this
y must be couched by y. other leg. At y. upper
part of y. tibia there is a knob, which serves
as a guide in amputation, it is just under y.
point of y. patella, & a strong ligament ties y.
point of y. patella to it & there is several
muscles inserted at no great distance from
it, so, as we mean to preserve these muscles
for y. uses of their action upon y. thigh
bone, y. Surgeon makes y. amputation evenly
under that knob & if y. incision be made y.
breadth of y. hand beneath y. articulation
he fully preserves y. insertions of these muscles
. When we join y. Astragalus to y.
Os Calcis & to y. naviculare, such beneath we
find an opening, or y. weight of our body falls
between y. heel bone & naviculare, or we want
a firm support here, y. place being filled
up by ligaments, & y. body rests upon
an yielding mass, whereby we sustain
a less shock in walking & jumping. A
considerable hollow & opening is made to
allow y. tendons, blood vessels, & nerves
to pass into y. sole. In y. foot y. bones
are

we may ajourn y. Court to some better opportunity
it is very difficult to come at, but y. Court ought
from one term to another.

We can not fully prepare for entering
upon y. examination of y. recent subject.

Sullivan Atty

Lecture 24th

We are now fully prepared for entering upon the

Present Subject, and, as I am merely to consider the Shape, y. Size, y. Colour, y. consistence, the very obvious use, & y. connexions of our several Organs, purposely omitting to trace y. Course & y. circulating, y. the Absorbent & y. the Nervous Systems, I am not confined to a particular Order; I may either proceed à capite ad Calcem, or begin with y. most complicated parts first, the method of separating y. demonstration of the Muscles from y. of all the other parts. I shall examine them in Classes observing at the same time the situation of the other parts with respect to them, as we do not learn y. mechanism of the Muscles of one part from knowing that of an other but they are fleshy, round, simple or compound according to the purpose they are intended to serve.

I shall begin therefore with the Eye, & with the Brain, these parts having more in their appearance by keeping y. Body, than any of the other parts (as) then I shall proceed to the Abdomen & so round.

At this meeting, we shall direct our Attention chiefly to the

Structure of the Eye, including y. parts in the neighbourhood, I mean however at present to

to give only such a demonstration of the parts of the Eye, as I have done of the Bones, I am not to enter into ye intimate structure of it, but merely to shew the situation & connexion of parts, for without the knowledge of the nerves & nerves our Ideas of ye Physiology of ye eye must be extremely defective.

The Eye is filled with pellucid substances called Humours, & we find in all 3 principal humours, the Aqueous which seems to possess the greatest portion of common water; the crystalline bears some resemblance to Crystal; & the Vitreous which resembles melted Glass, & the white of an Egg. The aqueous humour & crystalline bear as are nearly equal in weight (do not expect q^r V whereas the vitreous humour is about q^r 500 in weight, & it makes 10 parts, or nearly ⅔ of ye whole. The crystalline lens is included in a capsule of same substance, which we can demonstrate; & the Vitreous is likewise included in a capsule, but it is exceedingly thin, & is shown with the greatest difficulty. The surface of ye Vitreous humour is covered by ye Iris, or expansion of ye optic nerve which is not continued as far forward, as has been supposed, it does not reach ye Crystalline lens but

but

but ends at a certain distance from the fore part of the eye. Over the retina we find y. Choroid coat which is dark coloured on the inside, & on the outside brown like Chaped Snuff; the inner part is not composed of vessels but seems to be altogether inorganic or composed of dan humour (despoiled from vessels, & hardened) reaching y. Choroid coat ~~we find~~ we find it connected to the side of the crystalline lens, & therefore serving to make a partition between the aqueous humour & the Vitreous; as this substance from forming a large circle of the middle of the eye, is contracted to be connected to y. small circle, which the lens makes there is not room for a streight edge, but we find it folded like the flews of one's Shirt, they have been called ciliary processes, but from y. manner of the formation, it is evident that there is no space thro which light can pass between them, according to Sharp &c. who take this for granted, that light may pass to y. bottom of the eye, w.ch all passing through y. crystalline lens. On the outer side of Choroid we find a tough substance called y. Sclerotic coat, which is joined to the clear part of the eye. Winslow & others consider consider y. Sclerotic coat & cornea as the very same membrane continued

but

but they are different. This I have shown, in opposition to the common opinion, that the pia mater & dura mater are not continued to form the Choroide & Sclerotic coats but end in the Sclerotic coat, & are merely joined to it that the nerve keeps the dura mater aside, as soon as it comes to the Ball of the eye. Before it joins the Ball supplanted by the skin of the eye lids reflected upon the ball, so the eye lids are a doubling of the skin. The inner part grows transparent, but it is of the same consistence till it reaches the ball when it passes from the upper eye lid to the under so it is called the Tunica conjunctiva adnata. This coat likewise forms the anterior layer of the cornea, the cornea or clear part of the eye, & behind this clear part is a very curious curtain, the Iris, which serves to allow the light to pass to the retina in the proper quantity. All these coats except the Iris are joined together by the ciliary circle, which is to be considered as merely the connecting medium. I have also shown the Choroid coat & the Iris are totally different in their nature.

We next demonstrate the muscles of the Eye, it has 6 muscles nearly of the same strength & length, which come from the bottom

of

of the Orbit — is connected to y^e membrane of y^e Optic nerve, & to the membranes lining the orbit, from this they run straight forward, & end in tendons which from y^e clear part of y^e eye, these tendons are spread out, & give a greater whiteness to y^e eye, so called Tunica Albuginea; & y^e whiteness of y^e fore part of the eye have been thought owing to these Tendons, but y^e Sclerotic coat is every where white, only here y^e whiteness is more exposed, they are called recti muscles, being as straight as they can be from y^e nature of y^e place. If these Muscles act singly, y^e plain effect is to roll y^e eye, if two act at one time, y^e eye is drawn in a middle line between them, & if we act of them successively, we can trace a circle on y^e eye in the most accurate manner.

Next we find a muscle placed obliquely, or obliquely at y^e upper part of y^e eye, which serves to Antagonize y^e recti muscles, to draw y^e Ball forwards, wherein y^e whole recti must yield it into y^e socket, & to do this, y^e tendon of this muscle is provided with a pully which is fixed to y^e Os frontis, At y^e bottom of y^e ball, there is another obliquus muscle, which draws

drawn if. ball forwards & outwards, & turns it upwards.

Next we find Muscles for the motion of our palpebræ. Albinus calls if. inner one if. Orbicularis if. musculus ciliaris, but there is no natural division. We find in if. hollow of if. Os frontis if. lachrymal gland, & there is a chain of small knots like if. head of a large pin, connecting if. gland & if. eye lid, & if. ducts here thro' come from if. gland, but they are very small that Winslow & Haller have thought that if. leaves are separated by if. exhalant arteries & if. eye lids but these ducts can be filled w. Quicksilver, & they are found to terminate in if. upper Eye lid at some distance from if. corner of if. eye. Upon if. eye lid we also find glands that separate a viscid matter for if. defence of if. eye. The leaves are taken in at if. outer edge of both Eye lids by if. punctæ lachrymalia, & between these you see if. caruncula lachrymalis, & within it there is a doubling of if. skin, which in quadrupeds is called membrana nictitans. Linnæus supposes that this is wanting in if. human Body, & so separates if. Ape from Man, but in fact Man has it. It is small in us, & fastened

to the

linear shape, so it is named by some Valvula semilunaris. The pineala Gland, mallis lead to ye back part and side, & from that a duct proceeds down into ye mouth, I can enter a probe from the nose into ye throat ye bone in which it terminates, ye apertures spongiosum is one of those which varies considerably in their shape.

We find ye Articulari muscle connected with ye frontalis, & this last terminates in a tendon that covers ye whole head, till we are led to a small muscle at ye back part of ye head. Now you will attend to this, because mistakes have been committed here, about ye sensibility of parts This substance, that merely a tendon, has been considered as a part of ye pericranium, but they are only joined loosely together by Cellular substance, All ye lower end of ye Aponeurosis of the Temporal muscle, I can trace a probe downwards to ye Cheek, so where matter is collected in the Temples under ye Aponeurosis, it finds its way behind ye Zygoma, gets down to ye Cheek & forms a tumor there, you should therefore attend to this circumstance.

Lect: 35th.

Volum 25th

We nopt demonstrate of Structure of y.

Common Tegiments

You have all seen a thin invisible skin, naw a
lya Violet y: is called y. cuticle, & our skin.
When this is removed, a very tender part is discov
red, which is y. cutis vera, from which blood
runs out, if it is punctured or cut. Nopt you know
y: when y. skin is drawn out a little, we feel re
sistance, & upon letting it go, it falls back into
its place, or under y. skin, there is a connecting
medium called tela cellulosa, you know too y:
there is fat under most parts of y. skin, in some
places in all persons, it is considerable quan
tity. Besides when skin is pulled we feel con
siderable pain, so we conclude y: the roots of y.
hair are deep seated, much deeper than y. our
skin, you will observe too y: there are small
pores in certain parts of y. skin, particularly
in those places, which are exposed to y. air, or
perspiration, as in y. face, where are small pores
from which, matter can be squeezed, or there
are glands, y. ducts of which penetrate the
skin, their mouths appearing on y. surface

You

You may have observed too y^t the nailes are closely connected with the scarfe skin, so that by exposure to boiling water, they come off together. Now there parts form our common Tegumento, for there is no more to add, with the Authors, who wrote about the beginning of this Century, a tunica propria Musculorum a panniculus carnosus or a common Teguement to all y^e muscles, so to all y^e body. That we shall find is nothing more than Cellular substance collapsed the description being borrowed from the Quadrupeds as the Horse, which possesses the power of moving y^e skin to drive off Insects. We suppose a similar power in y^e forehead, & hind head, fingers, Feete, but we want it in the other parts of the Body.—

"The Cuticle is every where composed of two layers, an outer harder, & an inner softer. The outer is much thicker in some parts of the Body than in others, y^e inner is nearly uniform, in its thickness. These Layers are better distinguished in y^e, Negro than in a white person. The inner Layer has been described by Malpighius under y^e name of rete & from its softness he added mucosum. But both terms are improper

parts

particularly y^e name of rete; we would rather call it Corpus Mucosum, meaning by mucosum a coyne of stuff of these. It has been alledged that in y^e Negro y^e blackness is confined to the Corpus mucosum, Now I deny that fact altogether: It is spread there in greater quantity, but it is likewise to be observed in the other part of the Cuticle, only y^e nearer we come to the Surface, we observe the less of it, y^e air perhaps extracting the black colour & discharging it. The Cutis vera of the Negro has likewise a greater darkness than in us, may perhaps the whole constitution is in some measure tainted w^t this colour.

We next observe y^e surface of y^e Cutis vera mostly y^e Cuticle connected to it by a vast number of minute threads, which were demonstrated by my Father in this place 40 years ago, yet a late Writer have asserted these as a new discovery. We observe to that the ridges on the outer face of the Cutis vera are not formed merely by y^e Cuticle, but that the Cuticle covers these risings of the true skin, sinking into all y^e hollows. Next you observe y^e cut edge, it is white, opake, & gradually becomes softer as you

ye p. inwards, & y. whole is composed of a number of threads, matted very irregularly together, as y. threads in a glew. This has led Haller to suppose that the Cutis vera is composed of the threads of the Cellular membrane condensed, & the skin growing softer as we go inwards may seem to strengthen this opinion, nay it seems to degenerate into a fatty substance, which is sustained by a Cellular membrane. But notwithstanding of all this, that supposition confounds all distinctions, nay Haller himself describes them as being possessed of different properties, I would only say therefore that y. Cellular membrane runs into the skin, is lost in y. Cutis vera. The fat is supported by y. Cellular substance, & when we examine its structure, we shall find that it is divided in a very curious manner — We are at length brought to y. Cellular substance, we shall afterwards have a much better opportunity of being acquainted with y. Cellular membrane, I would only observe here that there is a free communication between all y. different parts of it, We see then the Cellular substance supporting y. fatty membrane, & both connected to y. Cutis

vera

ness the Cellular substance, & fatty cells essentially differing, for when we blow in air to the Cellular substance, it does not mix with y. fat, or when water is forcibly exhaled under y. skin, y. oil is not discharged, it may be consumed in y. course of y. disease, because y. body is wasted, but y. fat is divided in a most beautiful manner; & is found in exceedingly small sacs -

Sect. when we take a part of y. skin of the head, & examine y. hairs, we find that they penetrate into y. fatty membrane, & each of them comes from a little bulb, which is placed in the fatty substance. In like manner we find glands which penetrate y. skin by their ducts, as in y. skin of y. axilla we see a vast cluster of glands which are very different from y. fat. In y. face y. perforations of their ducts are very manifest & in y. skin of y. face I have made them still more so, only by taking off y. cuticle -

You have heard of people complaining of worms coming out of y. skin of their nose, & these are nothing else but y. sebacious matter lodging in y. ducts, & y. outermost parts of it drying, get a black colour, while y. next keeps its

ito colour. When we separate y^d. Cuticle, in tearing away the nails w^t. it, they agree very much in structure with it; we shall afterwards find a further proof that the nails agree w^t. y^d. Cuticle, by finding a horny like substance growing out from different parts of y^d. skin.

Since entering upon y^d. structure of the Tegumenta more fully, as also that of y^d Eye till we come to y^d. Vascular & Nervous System.

Lecture 26^th.

The Brain communicated.

Lect: 27^th.

To Refer to a much later part of the Course any enquiry into y^d. natural properties of y^d. Nervous System, y^d. demonstration we have made afford us at present very little room for making observations.

You have seen y^d. Cranium covered by a thin membrane which differs in no essential circumstance from y^d. Periosteum of other bones & to this y^d. name of Pericranium ought to be applied. It is connected to y^d. bone intimately by

by threads, & many of these are vessels of ye. colour of red Blood.

When ye. Cranium is cut, it is every where lined wt. ye. Dura mater, which like the external membrane closely adheres to ye. bone, & therefore we consider it in ye. first place as ye. external periosteum of ye. inner table of ye. Skull, just as we usually ye. term external periosteum to ye. membrane lining ye. inner side of our ribs. It requires considerable force to make ye. separation, & ye. surface of both ye. membrane & bone is every where covered wt. a number of red points, which evidently shows ye. closeness of ye. connexion, & ye. use of this membrane. By these ye. bone more freely communicates wt. ye membrane than it can be shown to do in any other part of ye. body. To every bad consequence yt. attends ye. separation of ye. periosteum usually here the Surgeon therefore should be careful in performing ye. operation of ye. Trepan here, not to use great freedom wt. ye. Dura mater. And if such a thing be given to ye. head as to burst ye. vessels, from ye. diminished thence proceeds a considerable quantity of

blood

blood must be extravasated between ye membranes & bone, which must have a dangerous effect upon ye Encephalon.

Upon cutting ye Dura mater, we find ye it is of considerable thickness, from which we are led to consider it as a cushion interposed between ye bone & ye brain. On ye inner side we find no adhesion, except where ye great vessels come out, but we find a glaring liquor diffused, & ye Dura mater has a number of vessels, & ye tunica Arachnoidea has none) yt can be demonstrated probably ye secretion is chiefly from ye Dura mater, as it presumes a secretion yt allows ye Brain to swell out & play upon it in the different states of compression, & dilatation in respiration wtout injury.

Yet ye vessels from ye Brain are covered by ye Dura mater, ye Sinuses are covered without & within by this membrane, so this membrane from its remarkable toughness serves to prevent ye rupture of ye large trunks of ye veins of ye Brain, & by attending to ye manner of ye connexion, we see a further purpose served by it, that they are depen-

ded

(sed from compression, & from ye thickness of the (dura mater), ye veins by passing thro' ye numerous (meach ye Sinus, ye obliquity & ye sharpness of ye (sinus), so yt ye blood (does not easily turn back into ye substance (matter) of ye brain, which would expose them to injury & all ye consequences.

Next we find ye (dura mater) (divideo ye brain & cerebellum into hemispheres, & (separates these organs by means & ye means (of ye falx cerebri, & cerebelli & tentorium cerebelli (super cerebrum). From this continuance ensues (is prevented from granulating upon another, either (during sleep, or in ye usual posture), ane ye several processes support each other, ye tentorium (draws down ye falx, & ye falx supports ye tentorium, & in some of these (animals are made for sudden motion, we find apart of ye tentorium ossified, or ye bone projecting to lodge ye (cerebellum in vaselu...)

Next we find ye (dura) mater covering ye Medulla spinalis, as it (does ye brain, & covering ye several nerves as they go out from ye bones, it gives a necessary (defence) as in

ye

of the nerves.

Next examining the surface of the Brain, we find covering it two membranes. The outer is a coat of vessels, & it is connected to the inner by a cellular substance. The cells are very minute & tender, & from the thinness of this coat, & its resemblance to the web of a Spider, it is named Tunica Arachnoidea. We see evident purposes which it answers it prevents too great an evaporation from the immense vessels of the pia mater, & we may consider it as serving the purpose which a Cuticle does to our skin, that it saves as a defence, by it the Brain is less injured in moving upon the dura mater; & it ties together the convolutions of the brain & is extended uniformly over the surface, so it is not greater than the apparent extent of the brain. But the pia mater enters (double into every one) of the furrows, so that by means of the furrows, the surface of the Brain & of the membrane, is vastly greater at first sight than you would suppose. Thereby it allows the vessels to divide into very minute parts before they enter the substance of the Brain, when they deserve to detach the pia mater from the brain,

of

ſ. ſaid à neceſſitance, from a vaſt number of minute
veſſels, & ſ. ſurface of ſ. ſame is every where covered
w.th red ſpirits &c.

We next find upon cutting into ſ. ſubſtance
of ſ. Brain, that ſ. cortical cineritious ſubſtance is
intimately connected w.th in to ſ. white or medullary
& that ſ. thickneſs of ſ. cortical is by no means ſo
great as at firſt ſight it would appear to be.
We are deceived by ſ. convolutions, but it is ſcarcely
equal in depth to ſ. ¼ part of an inch. The con-
nexion w.th ſ. medullary part is every where very
intimate, but in ſ. cortical ſubſtance ſ. eye ſees
very no fibres laid in a regular manner, parallel
to each other, which is evident in ſ. medullary
ſubſtance, as in a piece of wood, ſo there is a diff-
rence in colour, & in fibres, but we find anni-
hilate mixion, & we cannot shew cineritious
matter w.th out finding medullary produced
from it, or medullary ſubſtance without cover-
ing it (adhering to cortical at ſ. beginning
tracing ſ. medullary ſubſtance) we find ſ.t
at length a certain part of it terminates in
nerves, or beyond all doubt ſ. nerves are
ſ. nerves are ſ. continuation of ſ. medullary
ſubſtance

substance of y^e Brain, & they carry with them the membranes y^t invest y^e Brain, But with regard to y^e origin of y^e particular nerves, we can only point out y^e place at which they seem to begin, may not those of y^e very last nerves of y^e spinal marrow may have their first beginning in y^e anterior lobe of y^e Brain. Authors almost universally consider y^e Brain & cerebellum as employed in forming y^e nerves, but there are many fibres of y^e Brain, which are by no means traceable towards y^e origin of y^e nerves, & y^e bulk of y^e medullary substance within any one of y^e lobes forms a column which is usually larger than y^e column made by y^e Medulla spinalis with all y^e nerves of y^e back joined to it. But at present I only mean to point out this as a fact.

The last thing I would remark upon in y^e cerebrum, or internal of parts, y^t we find in y^e Brain, we see no adhesion except by large veins, between y^e dura mater & inner membranes, whether of y^e brain, cerebellum, or spinal marrow, as is a dropsy found between y^e dura mater & surface of y^e Brain it may pass into y^e spinal marrow, or if it is

to find in y^e spinal marrow. It may not unfrequently affect y^e Brain. So water found here may be y^e cause of y^e Spina bifida; that as I observed before this seems very often to be a local disease. Where water is collected in y^e head, we might expect to find it often here, yet such suspicions are extremely rare. I have opened about 20 cases of Hydrocephalus, & in every one of them y^e water was within y^e Ventricles, now in such cases y^e water is evidently within y^e whole Brain, & likewise y^e cerebellum, as it never fails to pass from y^e one Ventricle to y^e other. For under y^e anterior part & y^e fornix, y^e lateral ventricles communicate, & from this communication we find a passage leading down into y^e third, & from y^e third y^e passage is universally known into y^e 4th. But at y^e bottom of this ventricle, y^e cavity is shut by membranes, or there is no such communication as Haller has supposed between y^e 4th Ventricle & y^e Spinal marrow. The passage between y^e lateral ventricles may be affected by Inflammation, & y^e surface may grow together, when y^e water may be confined to one side of y^e Brain, but I don't suppose this

this to have happened we often see & have alledged for an opening of the head of water in Hydrocephalus from one ventricle to the other, in consequence of a communication at the same time, & not from any of the possibility of the cave, but in general of water is contained in all of Cavities of the Brain & they all make one general Cavity. We do not well understand of one of these Cavities, we have certain distinction of parts, but Incarnation does not point out of nature & use of each. Perhaps they prevent of adhesion of the several Substances but there may be something more, How from of water, it is evident of do we answer to imitate an operation, which has been proposed & even practiced by ingenious Surgeons, viz. The opening of Brain w.th of Trocar to let out water in of Hydrocephalus, If of water is between of dura mater & surface of of Brain there is some little chance of relief, & there is no great degree of immediate danger, but if it is within of Ventricles, of fluid deep is to plunge of Instrument thro' of Cortical & medullary substance, or if we do it in of middle, we must wound of Corpus callosum which will

prove

prove hurtful probably of the Ø, & y. water rushing
out y. parts would collapse & be torn, so in the
cases of Hydrocephalus, I have found y. septum
lucidum torn by y. weight of y. water in y. cavities
ventricle, not passing readily thro y. hole, when
I had cut into y. first ventricle.)

We next examine

The containing parts of the Abdomen

We find in all 11 pair of muscles in y.
Abdomen, named from y. direction of their fibres
& one pair named from their shape pyramidalis
which are wanting upon y. whole in one person
of 20 or 30. The under tendinous part of y. obli
quus externus descends to process over from
y. anterior spinal process of y. Ilium to y. Os
pubis, & have been called y. ligament of Fal
lopius, & that this y. spermatic
cord in Man passes, it pre-serves thro tendon
y. fibres of which decussate one another, so
as to form a round hole, it is somewhat of
an oval shape, but w.t one end of it ending
sharp, & it is filled w.t cellular substance
& w.t tendinous fibres, some of which pass
from y. tendon along w.t y. spermatic cord

going a finger's breath to it in this place. From this part there is also a thin membranous substance continued down upon the thigh to defend the muscles in some few subjects. I think I have seen fibres of the internal oblique passing behind the spermatic cord but in most cases of the dissection of the abdomen the internal oblique is found. That the spermatic cord goes below the internal oblique, is not perceived at all Douglas represents, that there is nothing from the internal oblique, but that it is confined to the external.

It is necessary that you should attend to the manner in which the rectus is situated, or to the manner in which the several tendons get to the linea alba. Albinus is the first Author, who has given a tolerable idea of it; when you look behind the rectus muscle at the lower part, you find only cellular substance with fat, & within that the membrane called peritonæum, & this is the case for some way down to the Os pubis.

What then is become of the tendons of the broad muscles? They are all joined together, & enclosed over the rectus muscle, to the linea alba, & are there connected to the tendons

of

of y. other side, hence y. opposite. Muscles may be considered as Digastric. But above this place I find not only tendon before y. rectus, but I observe immediate tendon closely adhering to y. peritoneum. Now how do we explain this? it is plainly this, Half of y. tendon formed by y. two obliques & y. transverse muscles passed before y. rectus & y. other half behind, That is, y. whole of y. tendon of y. external oblique, & y. half of y. tendon of y. internal oblique cover y. rectus & conceal it; again lifting up y. rectus, we see y. other half of y. internal oblique tendon; & y. whole tendon of y. transverse, And we cannot only understand how y. rectus is taken in, but can give a reason for it. For as our Bladder of urine is situated here, y. part above it needs to be loose, & to have a free play, so y. peritoneum is only connected to y. recti muscles by means of a loose Cellular membrane. But higher up a greater firmness is given to y. peritoneum, to defend us against Hernia, & this circumstance of y. want of tendon at y. lower part is one reason why we are exposed to Hernia, y. Peritoneum yielding more. Now after

occurs

seeing this structure of ye tendons, their joining ye
interosseal ye structure of ye Linea alba, which is
only ye meeting of ye tendons of opposite sides, in
ye interstices of ye recti, ye recti not joining by
their edges close together, so ye fibres decussate at
this place. In ye middle of ye linea alba ye umbilicus
is found, which is only a hole in ye tendons of
these muscles, which lets out ye vessels yt con-
nect ye Child to ye Mother.

Now after seeing these Muscles, I
apprehend you will easily understand ye manner
of their action, a very few things only need to be
premised concerning muscles in general.

The name Muscle is from ye Greek
word μυειν, to contract, as they possess ye power
of shortening. To enable them to do so, to slide &
play freely on ye neighbouring parts their own
face is covered w^th a Cellular substance, which
when collapsed gives ye appearance of a coat
which was formerly named Tunica propria mus-
culorum. But as every fibre plays upon another,
we must find yt ye Cellular substance is inter-
posed between all ye fibres of ye muscle, tho'
ye threads between ye fibres are shorter than
between,

between ye general bellies of ye muscles, but still they are to be diverse, when we follow any muscle to its attachments, we find it to end in Tendon, & ye fibres of ye tendons lying in ye same general direction with those of ye muscle. Anatomists have generally taken it for granted, yt ye tendon is ye tendon is ye flesh made harder by pressure? & yt even parts of our muscles degenerate into tendons by age. But it is better to consider them as distinct substances, yt ye tendon is to be diverse as ye ligament or rope tying ye muscle to a remote space of ye bone. The giving it ye same direction, gives it ye greater strength, ye fibres not being drawn asunder, may in some places where a Muscle needs a number of fibres, & cannot with a tendinous membrane, if it can lay hold of neighbouring bones, ye tendinous fibres (as also their direction from yt of ye muscular fibres) The arguments in favours of their being of one substance have still less force, they not only differ in colour, hardness &c, but ye muscle is highly sensible, while ye tendon possesses very little sensibility, at any rate ye tendons have no power of contraction, & is to be considered

(red merely as a bond between ye muscle & ye bone.
The fibres of ye tendon are more closely connected
so that a part of a muscle be torn, broke, or cut, it
preserves its general power, ye remaining part
of ye muscle acting upon every part of ye tendon
that wt less force.

When a Muscle is thrown into action,
like any other stretched cord, it endeavours to bring
itself to ye straight line, but they are not always
shortened when in action, on ye contrary they may
be elongated by a superior force. Thus when I
let down one of these Skeletons, I find wt ye
cow muscle of ye arm, at ye same time draws
ye arm to lengthen, And me thinks in ye power
in ye most gradual manner, that seemingly in
instantaneously, seldom moving two bones, or two
parts at ye same time, as soon as ye lowtness
violence yields, ye power is no longer determin
(red into ye muscle.

The strength of a muscle like that of
a rope, must depend upon ye number of its fibres
while ye extent of its action must depend upon
ye length. With regard to ye extent of their action
& by physiologists ministers, deserving from ye
manner

manner in which y. muscular fibres on the reflux
cöe to act. They have considered a muscle as full
of [illegible] bodies, & concluded that, like a bladder
when drawn out, it never can shorten itself more
than one third. . but in general four muscles short-
ten themselves so much, but in several parts they
shorten themselves more. In general they are of
a red colour, but not always, & those y. are y.
reddest have y. greatest power of contraction.

Now after knowing this much of y.
action of muscles in general, I suppose y. the
action of y. Abdominal muscles may be explained
in a few words, beginning w.t y. most simple of
y. lectus, When y. Belly is compressed it is in
most people, & it acts, it by endeavouring to bring
itself to a straight line, compresses it, then it
next acts upon y. ribs, if these have been rai-
sed as in inspiration, & we shorten y. inspi-
ratory Organs, it draws y. ribs down, or is
a muscle of expiration. But, is not content
w.t this gentle action, we shorten it still more
it' muscles y. inside thorax forwards, & backwards
y. Body, as if I am to push a substance
before me I act w.t y. recti muscles, draw
y.

y.e thorax forwards, & twist y.e body. (But suppose a person taken hold of a Bar, & acts strongly w.ch twists muscles y.e thorax round y.e bar, therefore of course y.e pelvis will be drawn upwards, & y.e body may be thrown over y.e head, or we can throw up y.e feet to a Beam above us.

In a similar way we explain y.e action of y.e oblique muscles, making allowance for y.e obliquity of their fibres. The external oblique draws down y.e ribs in a slanting direction, pulls down y.e body, & at y.e same time turns it over to a side, or twists y.e body. The internal oblique has a similar effect, may y.e external oblique of one side, concurs w.ch y.e internal oblique of y.e other in y.e same action, so we may consider them as one digastric muscle & as a continuation of each other, as y.e operation is perfectly similar, only y.e right external acts at y.e same time with y.e left internal, & vice versa, or we may throw all y.e oblique muscles into action at once, or only a pair of them, & y.e obliquity of y.e one balancing y.e of y.e other, we bring y.e body straight forwards, just as we do by y.e recti muscles.

(1

I would only add, yt. by ye. oblique muscles, we can perform a greater flexion & motion than by ye. recti Tabe any proportion of ye. contraction, you will suppose 1/2., when ye. rectus muscle acts, ye. cartilago ensiformis cannot descend towards ye. Os pubis more than one third, but when ye. oblique muscles act, ye. one ballancing ye. other, we can bring ye. cartilago ensiformis nearer to ye. bones of ye. pubis in a greater proportion. The Transversales have a more simple action, they act a little in drawing ye. ribs down, but they draw them inwards, so they are muscles of respiration serving to replace ye. ribs, & are therefore ye. proper compressores, or constrictores Abdominis So they are drawn around from Bone to Bone, & a considerable part of them is tendinous, as it would be unsafe to make ye. circle of muscle, ye. contraction would have been too great, & must have affected in a dangerous manner ye. contents of ye. Abdomen The effect of ye. transversalis muscle, is to enlarge ye. action of ye. recti, by taking them into a sheath, Without that we soon should tire ye. body, ye. recti would have hurt

but

but by lying them down, they are kept in y^e state
we when we are pushing a substance before us
by force; y^e transversales are thrown into action
action, tho' not directly contributing to y^e motion
of y^e Thorax, but only to enable y^e others to
continue their action.

The Pyramidales being frequently
wanting, shows y^t they have been properly named
med rectorum succenturiati, y^t their defect
can be supplied by y^e recti, which in thinscows
have generally some degree of enlargement
at their lower part, perhaps they may more
accurately enable persons to empty y^e bladder
(or urine), than from their small size
their effect this way must be inconsiderable

From y^e particular action of these
muscles, y^e general effect in y^e spontaneous
respiration, will be readily understood. They
are not only to be considered as resisting
y^e parts after inspiration, to which they
are solicited from their being stretched
but they promote y^e circulation of y^e blood
in all y^e vessels, they push on y^e contents
of y^e veins, whether red, lymphatic, or
lacteal

tactual, & food being received into & tasted in
passing on to & Thoracic Canal, while at & same
time, they promote & descent of & Excremental part
we also employ these muscles in speaking
in laughing &c., in expelling & urine, & faces
& in delivery, & we act powerfully w^th them in
vomiting, each of these actions you may con-
sider at your leisure. — — —

Sect: 28th

The contents of & Abdomen demonstrate &
particularly & Chylopoetic Viscera, or Alimen-
tary Canal &c —

Sect: 29th

Having examined & situation & & connexion
of & Abdominal Viscera, & more particularly
of & Alimentary Canal, we now proceed to
consider & structure &c.

Sect: 30th

Let us now review & Demonstrations made
in & two last meetings —

I apprehend it may be unnecessary
to

to allow you with pointing out y. Regions in which Physicians suppose y. Cavity of y. Abdomen ar Belly to be divided, in describing y. seat of Diseases, or in directing to y. making external applications, as Blisters &c. for these as soon as mention'd will readily occurr to you ... The uppermost fore part is called y. region of y. stomach, or Epigastric Region, & y. sides lying under y. Cartilages of y. ribs, are named y. Hypochondriacs Regions, Under these by y. Liver, y. Spleen y. Pancreas, y. root of y. Omentum, w.t y. stomach & middle arch of y. Colon, w.t a share of y. Kidneys This reaches as far down as y. 7th or 8th rib. The space between, this & Saline drawn between y. anterior spines of y. Ossa Ilia, is called y. Umbilical Region, & y. posterior part y. loins Under y. fore part by y. small Intestines all y. turns of y. Jejunum, & part of y. Ileum & at y. posterior part at y. sides of y. vertebra we find y. lower parts of both Kidneys.

From this to y. Os pubis is called y. Hypogastric region, & y. sides are called Ilia, & here we find y. lower part of y. small Intestines, y. lower turn of y. Colon, ye Sigmoid

Flexure

Sequire; & I may add ye Caput mortuum coli, which by its weight falls down into ye hollow of ye Ilium

Now next let us attend to ye Structure of ye several parts, & first we begin with ye general covering the

Peritonæum This is a single membrane, (per Winslow & those who speak of it as double) have been led into a mistake, from finding water between this membrane, & ye muscles, as if it was contained in a doubling of it; But this occurrs in ye Cellular substance in other parts, & by dissecting it, we only find a loose membrane connected to ye neighbouring parts by Cellular substance. From ye inner side of ye peritonæum, a mistake or liquor is deposited, not by visible pores, as Winslow alledges, they are too minute to be seen nay I never observed Glandular Organs in a sound Body, from which a secretion could be made, or we must imagine ye a number of invisible exhalant vessels terminate upon ye surface, Following ye peritonæum, we observe ye it not only lines ye containing muscles but with a very few exceptions, gives an external coat to all ye Bowels, & stretched from

one

me Bowel to another Jejunu. Mesenterico, to which
y. name of ligament in many places is given
& y. Liver is suspended by y. Peritonæum, &
y. manner of y. formation of y. suspensl is perf
peatly evident, or, in like manner we observe
y. Intestines connected to y. Body. The y.
Mesentery is only y. doubling of y. Peritonæum
with Cellular substance in which y. blood vess
do run. The large vessels run down along y.
spine, & give off branches, which run in y. doub
ling of y. peritonæum, or Mesentery, & this Mem
brane parting up over y. Gut, & down upon y.
opposite side, y. Intestines and tied to y. back y.
Hence, by Dissection, one layer of y. Mesentery
can be raised from y. gut, particularly in y.
great Intestines, where y. connexion is lesser
& yat interposed, & y. intestine left bare, wt.
y. blood vessels, so, tho we usually say yt all
y. Bowels are contained wtin y. peritonæum
yet attending to y. nature of y. covering, it is
evident yt. they may be left upon y. outer side
of it, just as a persons head may be said to be
on y. outer side of a double Night Cap, for
one layer of y. peritonæum is contiguous to y.
Bowels

Bowels, & yt. other is Contiguous to yt. Abdominal Muscles, & between them nothing is interposed but yt. humour which is intended to prevent ye[ir] Contretion, & to allow of an easy motion, in to wch. sense (idea of yt. way in which all yt. bowels are covered, we find that yt. peritonæum connects yt. whole way round to muscles by Cellular substance. Then we observe a ligamentum latum at yt. middle of yt. liver, formed by yt. peritonæum which goes off to cover yt. liver. Then in yt. concave part of yt. liver is yt. Omentum minus, wch. connects yt. liver to yt. stomach, yt. peritonæum passing over yt. stomach, & going down at yt. back part of it, or yt. Omentum minus is a doubling of yt. peritonæum wch. [illegible]. Then yt. stomach is seen hanging down yt. great omentum, which is formed in yt. following manner. We have observed yt. yt. Omentum minus is a double membrane which opening takes in yt. stomach, then yt. two layers, joining together, form yt. anterior part of yt. great omentum. In like manner yt. posterior part comes from yt. great intestine, for yt. peritonæum passing over yt. pancreas lies it down, arising from yt. spine it forms

yt.

y. mesocolon then y. mesocolon is firmly tacked on y. Colon, & is produced to form y. under or back part of y. great omentum, & y. great omentum of y. stomach & Colon are drawn asunder, it is double, but in its natural situation, as lying over y. intestines, it is quadruple. (Dr Hunter tho' he has touched some parts upon this subject, yet misses this observation, & considers it as a double membrane, but when we trace y. Structure, it is evidently quadruple.)

The Peritonæum is next continued & rising from y. Mesentery, then it comes back to y. spine, then lies over y. Intestinum rectum & descending from y. fore part it covers y. upper part of y. bladder to which it is connected by Cellular substance. Now it is evident, y. in consequence of this structure, y. vessels can run from y. great Trunks to y. differ. parts most readily.

Now as there is no space left between y. Peritonæum covering y. Abdomen, & y. part of it which lines y. Bowels, except perhaps so much as is sufficient for lodging a few spoonfuls or two of y. moisture, y. is intended

intended for lubricating ye parts, it is evident
yt ye opening of ye Abdomen in a living Animal
is a difficult operation, & ye throwing a Trocar
into it must be highly dangerous, & it is only
safe in ye case of Ascites, when by ye water
ye containing parts are thrust at a distance
from ye contained, ye Intestines, & ye guts adhering
to ye Mesentery, which is connected to ye backe
bone, hence, we make ye perforation where ye
parts yield freely, & where ye several turns of
ye Bowels are accurately tied down by ye membranes
to ye parts behind.

Next it is evident yt there is a free
passage, ye whole way between ye surface of
ye Bowels, & ye containing parts, so we distinguish Ascites by ye water falling to ye
undermost part, while in local Dropsies
ye tumour keeps nearly to one place.

The colon from ye nature of its office
containing ye faeculent matter hardened, is
very subject to diseases, so in morbid Anatomical Bodies, we find an adhæsion of ye
upper arch of ye Colon, ye whole way across
ye Abdomen, & if a dropsy succeeds ye ad-

hæsion

lesion, there may be a necessity for making two punctures.

If I knew one part of ye obstructure, I would make some observations, which have not been alluded to, with regard to ye great vacity, to wch ye foramen of Winslow leads, behind ye capsule of Glysson, where we find a hole big enough to admitt a couple of fingers. It passes behind ye stomach, & omentum minus, between ye stomach & mesocolon & colon & so into ye cavity of ye great omentum. Now as ye foramen of Winslow is ye only outlet from ye cavity, & as it seems to ye right side, we are not to prefer making ye puncture in ye case of Ascites upon ye left side, on ye contrary as a general rule, I would prefer ye right. The reason ye Surgeons generally prefer ye left is, as ye liver often is ye cause of ye dropsy, becomes schirrous & occasions wt hence they conceive ye ye liver pushing down may come in ye way. But I would alledge yt such an enlargement of ye liver happens only very rarely, & we are roughly told ye spleen in a diseased state & considerably enlarge, & when it is diseased it

it is more apt to change its place than ye liver, from ye looseness of its connexion. So in ye Booke mentioned by my Brother in ye Preface you have an instance, where in ye cave of an enlarged Spleen ye Surgeon made ye Juncture in ye common way, & wounded ye spleen, it was found to be ye cave after the patients death, & may without being much enlarged it sometimes changes its place, I saw a cave not long ago, where after delivery, it had fallen down some way, so ye danger of Juncturing ye spleen is nearly as great as ye of Juncturing ye liver, Ingeneral we can examine, if either is in our way, but should we not know ye state of ye Bowels, ye dilatation lyes in from danger, & when we make ye Juncture on ye left side, ye way to which ye Somachs of Animals lead, remains filled w^th water, whereas making ye Juncture on ye right side, we can empty every drop of ye water. Further ye water may be confined to ye particular place, from a contraction of ye mouth of this Intestine, in consequence of some degree of Inflammation, & ye liver being in a deceased state, & proving, an

Unnatural

obstruction by ye free return of ye blood, a dropsy may happen more readily here than elsewhere, & in the cave of stomach & colon with ye omentum will be pushed forwards, between ye water & ye containing parts. So where ye water is confined to ye inferior part of ye Abdomen, in making ye perforation, we ought to work ye trocar like a drill, rather than plunge it in suddenly at once, as Surgeons generally do.

We next attend to ye structure & situation of ye parts of ye

Alimentary Canal. first considering what is common to it, as we have one general structure, then we shall make a few remarks, where circumstances that exist to ye different orders occur.

In all we have seen three, or as Anatomists commonly reckon four general coats in ye Alimentary Canal. The first coat is ye continuation of ye peritonæum, & whilst we mention ye use of it, we in general mention ye use of ye membrane viz. that by its slimyness, it enables ye canal to contain ye air & ye other substances taken in thro' it

to

to ye meal during the act of it. And ye cause of ye bowels in general by means of ye peritonæum is extreme stiffness, whereby they form thick lines on each other, & cause, one part to slide on another with less friction, & ye less danger any peritonæum proposes a smaller degree of vomibility than ye next coat does, & ye peritonæum has power to pull ye danger of adhesion between ye different parts in thereby to prevent this is by no means an uncommon occurrence.

Within ye peritonæum is a muscular coat, & however insignificant that may appear yet ye proper function of it is altogether necessary to ye maintaining of life, for without the action no external pressure can push ye food thro ye canal. Let any one attempt to cause Quicksilver by ye pressure of his hand, or even ye agitation of ye belly to describe ye turns of ye intestine, he will find it impossible, because of ye length of ye intestine, & ye turns made upwards as well as downwards. So ye action of this coat is absolutely necessary, & ye manner in which it performs is this.

When

When we last mt. Authors, y. general mode of
action is described under y. name of peristal-
tic & anti-peristaltic, but y. greater number
have a false notion of this action. When a
Stimulus is applied, or a portion of food is tak-
ken into y. mouth, they suppose y. there is
a continual action, w.out any intermission
from top to bottom, y. y. matter of y. food is
in perpetual motion. Now y. motion is not
so observable, that many seem to conceive
& we shall never find y. it is uniform y. from
top to bottom, but y. it goes on in a wavering
irregular way in different parts of y. tube
may from seeing y. action in life, upon laying
open y. Abdomen, we are able to deter-
mine y. action of y. food. We may compare y.
motion to y. of y. Sea, which when it is going
out, appears is come in, & go out alternately
; we scarcely distinguish which motion is
y. greatest. We observe much y. same of
y. Alimentary Canal of Animals, whenever
it is stretched w.t food, there y. motion is
considerable, it goes on, stops, then y. motion
is renewed again, so y. Anti peristaltic mo-
tion

tion is a natural one, as well as ye formation & ye
power to turn over ye food in all possible ways, from
ye disposition of ye fibres, which are placed longi-
tudinally, as well as circularly. When a portion
of ye canal is irritated by ye food, first there is
a contraction of ye Circular fibres, immediately
above ye irritation made, for there is a general
determination of nature from above downwards
(in whatever way ye stimulus be applied, nor
from an inversion of motion is not inverted
because ye irritating substance) first forces
ye lower part, but ye natural motion continues
notwithstanding, so ye part, to which ye stimu-
lus is applied contracts & makes a perpendicular
to which ye other parts can be drawn, & ye lon-
gitudinal fibres are in action to shorten ye canal
& to dilate in some measure ye under part, &
here, as when we pull a stocking upon ye leg
ye effect is much ye same, whether ye food is pu-
shed down into ye gut, or ye gut pulled up
upon ye food, & by this means ye Circular fi-
bres push on ye contents with ye greater ease
& a further way in a shorter space of time
Upon ye whole considering ye use of ye mus-
cular

cular coat, they are various, & highly important & necessary. First a general motion & agitation of y. food, serves for y. mixture of y. several parts & dissolves several parts, combines them, promotes y. general discharge. Fluxions into y. cavity of y. Intestines, which are highly necessary to Assimilize y. food, & to dissolve it as a Menstruum. Next by y. muscular action, y. food is turned over & over & prevented in various ways to y. surface of y. Intestine. Now there is a motion downwards, & certain surface touches y. inner coat of y. Intestine, then this motion is reversed, & a different surface is presented, so y. food is more accurately applied to y. mouths of y. absorbent vessels, while by y. general motion, y. faeculent ~~matter~~ part is carried downwards. Now no general pressure could have this effect, nay a palsy of y. whole, or a part of y. Alimentary canal, must prove fatal in its consequences, & while y. faeculent part is carried downwards, y. useful part already received into y. lacteal vessels is pushed on towards y. heart. Then y. food is not pushed into y. lacteal vessels but is imbibed

imbibed, as ye power on ye surface of ye globules im-
bibe their nourishment. But ye muscular coat
pressing upon ye food contained w^th^ in ye intes-
tines, pushes ye food onwards with considerable force, in so
much yt in several different experiments, after
tying up ye thoracic duct, I found ye same large
branch of it, and quicksilver injected, I pushed no doubt
yt ye muscular action of ye Alimentary canal
had its part in occasioning ye rupture.

Within ye muscular coat, we find two
others called nervous & villous, The name of ner-
vous is known by all accurate Anatomists to
be improper, only we retain it for want of a
better. For it is difficult to trace nerves into
it, ye branches become so minute, before we
get this length, yt we in a great measure lose
them, & it is difficult to show that that coat
possesses any high degree of sensibility. But
not only is this name improper, but ye ideas
of authors w^th^ regard to ye nature of these
coats are still more so. If you look into ye
most recent writers on this subject, you will
find yt some think yt ye villous coat is con-
tinued ye whole length of ye intestines, & ye nervous ye whole length
But

But if villous coat resembles both, & we need no other argument in proof of this than ye vast number of vessels & ye high degree of sensibility which it possesses, so I would consider ye nervous coat to ye subcutaneous cellular membrane without ye fat; it is like ye cellular substance condensed, only ye threads are finner & shorter & I have shown ye by blowing in air, we convert it into cells, along ye threads of which ye blood vessels & nerves are conducted to ye villous coat. So like ye cellular membrane to ye skin, it gives a certain degree of firmness & support to ye villous coat, keeps it in its place, and conducts ye vessels to it, & ye villous coat like ye skin, is covered w! ye Cuticle, which is very thin, & is scarcely to be raised, but is certainly present, I think I have seen it thickened & even separated, as in cases of Aphthæ, from ye vessels. These Aphthous spots, which are seen in Children, are generally thought to be a membrane, but in some cases by separating this matter, ye immediately seen vible surface was exposed, as there was an excoriation, & often, when there is a separation,

low of sloughs, as in dysentery, the Alimentary
Canal is exquisitely sensible, just as the skin
is, when the cuticle is separated from the surface
of the body.

The two minor coats, the nervous & villous
are much longer than the other coats, & hence we
find a number of rugæ, or valvulæ conniventes
the place of which is more permanent than some
seem to imagine, the small stuff the place of the valve
without using considerable force.

The cell of mucus surface villous, I
have a strong suspicion, that the villi are further
subdivisions of these valves, consisting of every
valve is subdivided till the parts escape the naked
Eye, as the villi serve to increase the surface of
the mucus part of the Alimentary Canal very con-
siderably, & to make a certain resistance to
the descent of the food, or to the ileo coming back to
again in the anti-peristaltic motion, further
there is by means of these valves, a closer
application made of the food, it is entangled
by the greater doublings, & the surface is im-
mensely increased, for a greater number of
chalant & inhalant vessels, the food is

more

men animals, yt is men naturally receives nile yt low
dilution, so yt we can assign reasons for this diuc
tion, for a general defence yt diuine is separated mt
yt Alimentary Canal from a number of pores, which
we cannot show wt yt naked eye. The same most
remarkable about yt Pylorus in yt Duodenum, about
yt end of yt small Intestines & yt middle of yt rectum
& what we see in these places, we presume to take
place in all.

Let us next view yt particular parts of yt
Alimentary Canal, beginning wt yt

Stomach, and first you have seen yt
yt Oesophagus goes thrd yt fleshy part of yt Dia-
phragm, wch we observed, yt when yt Stomach
is moderately distended, instead of lying with
yt flat sides forwards & backwards, these are
turned upwards & obliquely downwards, & there
is a resistance made to yt ascent of yt food, by
yt turn yt stomach makes wt yt Oesophagus
where it is joined wt it, so yt contents of yt
stomach must not only ascend contrary to yt
weight, but there is a resistance made by this
turn, as also by yt fleshy sides of yt hole of
yt Diaphragm, thrd which yt Oesophagus passes
wt

which swell when ye Diaphragm is in action, & ye contents of ye stomach are most in danger of being thrown up, not but ye accent of ye food may take place, when ye Diaphragm is in action, ffor I can swallow in ye time of inspiration but it is w^t a certain degree of difficulty.

Hence from what we have remarked ye in proportion to ye distension of ye stomach, ye curvature is turned more towards, & ye Angle between ye Oesophagus, & ye stomach increases, as ye stomach possesses ye same general situation w^t ye rest of ye Alimentary Canal, how long that canal please, extending from ye Larinx to ye Anus, which are put upon ye stretch, so ye bellows are slackened, it is evident ye, that a certain quantity of liquor is necessary in ye time of Vomiting, if ye stomach is greatly distended w^t liquor, it is in danger of burst[ing] not ye^t this so readily happens as one might imagine from viewing ye dead body, for in life ye parts support each other, when they are in ye situation of a thin bladder included in a tough ball, ye containing parts of ye Abdomen serve a similar office

Hence

Nept we observe yt in proportion to yt stretching of yt stomach, yt Pylorus ascends higher, when y stomach is empty, this part hangs down, but when it is distended, it comes more nearly to yt same height wt yt upper orifice, yt yt heavy & indigested parts of yt food may not pass out of yt stomach by their weight, while in yt course of Digestion a quantity of air is engaged wt yt food, & renders it lighter, so yt it swims upon yt surface, & from yt situation of yt Pylorus, that parts of yt food are chiefly received into yt Intestines.

From attending to this situation, we see yt propriety of yt direction given by Winslow for discharging hard substances from yt stomach into yt Intestines, i.e: first to lay yt patient upon his Back, then to turn him to yt right side, Thus suppose a Child to have swallowed a shilling, which is a case I met wt some time ago, & yt Child had been accustomed to no purpose, I followed nearly Winslows direction turning yt body to yt right side, then turning it to yt back, after I had endeavoured a gentle purgative, yt day yt Shilling did not come away

away, but it (did come) away ye next, & I marke no (doubt) yt ye posture (did contribut) somewhat.

At ye inferior orifice, we find not only a thickening, but ye real muscle, yt makes a compleat sphincter, & this acts wt so much vigor, yt in such Animals as take in hard substances to ye stomach, as Birds, which take in small stones, we shall find hardly any of these hard bodies within ye Intestines, & if in ye human Body they pass, it is (done) with a (degree) of pain.

I have seen a cave where pretty large Gon? stones were vomited, but yt orifice by ye action of ye muscle, is a great deal smaller, than it appears in ye dead body.

Next we find ye Duodenum tied very closely (down to ye posterior part) & ye Jejunum by a Cellular membrane, it appears not only larger, but makes several turns, & receives particular liquors into it, so it has been called very [illegible] properly by Bidloo Venter inferior succenturiatus. After it has crossed to ye left side, it receives ye mesentery, & is changed into ye Ileum, then we find this terminating in ye Cæcum, but we cannot say, where ye

Jejunum

Jejunum ends, or where the Ileum begins, so we might w.ᵗ Physicians, comprehend both under the name of Ileum. The general differences are, 1.st the upper part is longer, 2.d more numerous, from a necessity of a greater mixture of the Animal liquors, w.ᵗ the crude aliment, & 3.d greater absorption of the nutritious here. - -

At the bottom of the Ileum, we see a manifest lumen to the right side, & join w.ᵗ the Colon, where we find a straitening in the dead Animal, & the structure will be necessarily increased in life (because the action of the Ileum, enters at the side of the colon, the circular fibres of which being stimulated by the distension, must contract together in the dead body. There is a certain degree of resistance, when air is thrown in, & from the action of the muscular fibres straitening it will still more in life, it will be necessary, when throwing up air, or other matters by way of injection in the case of Ileus, to proceed w.ᵗ the greatest caution, for if there is feculent matter in the caput coli, the injection cannot be pushed further on, & those who have reasoned differently

a-

an Ileum, have made their appearance upon Dogs where the connexion here is more like to that of the Duodenum with the stomach.

We would consider the appendix vermiformis as an Organ separating slime, or a quantity of mucus to be added to the feculent matter in a particular use, where the appendix is wanting we find a mucous gland situated near the place of it, & in some cases there is a considerable quantity of slime found within it. We observed that the use of the caput coli is to circulate than that of the continuation of the colon, as Balls sometimes form here, & it may be impossible to cause them pass forwards, from the loosening of the Diameter of the Gut.

We find that the colon from the several turns it makes is contiguous to almost all the (dominial Viscera), so that when we examine those on the suspicion of obstinate tumours we shall to attend to the state of the Belly, least we mistake hardened faeces for such tumours, or be deceived by such Balls, as I saw just now mentioning.

We also judge of the effect of Injections upon

upon all ye Abdominal viscera ye whilst they are in charge of ye contents of ye Intestines, they prove a fomentation to ye several Abdom.l viscera.

Lastly it sometimes happens ye errors mens are made, & ye patient gets rid of ye worms, we from ye situation of ye Abdom.l viscera. I have remember'd above ye was treated in ye Royal Infirmary by Dr Wyll. who vomited ye injection ye were given in Ex.s minutes, al ye same time food taken into ye stomach, was not so immediately discharged by stool, insomuch ye surgeon examined ye patient, & where ye large orifice of ye colon passes immediately under ye stomach, there was an adhesion of parts, & a number of hard lumps, so there had been an immediate evacuation but as ye patient did not die, I had not an opportunity of ascertaining ye particulars of ye case. In like manner where ye liver suppurates, its contents may be discharged into ye stomach, & hydatids have been passed by stool, & in Dropsies of ye ovaria, & when suppurations have taken place, matter has been discharged by stool & an evasion having taken place, fully explains this. ——

Let: 31

Lecture 31

Having seen y^e situation & connexion of y^e assistant Chylopoetic viscera, y^e Omentum, Pancreas, y^e Spleen & y^e Liver, we are now to examine their structure as far as can be done by Dissection.

Lecture 32

As y^e assistant Chylopoetic viscera perform their office by means of secretion from y^e blood, we cannot pretend to explain y^e manner of that, till y^e course of y^e vessels, & y^e intimate structure of y^e parts be fully known, when we shall at considerable length attempt to determine not only y^e general office of each, but y^e manner in which y^e office is performed.

We observed of y^e Omentum, even in y^e most posture of y^e body, only reaches somewhat lower than y^e Umbilicus, while in y^e Quadruped we found it extended as far as the Pubis, hence we see y^e impropriety of considering it, as shown, as intended for preserving y^e warmth of y^e Abdomen, for, as y^e lower part needs as much a defence as y^e upper, this would not be put out of y^e question, and, I would assign it

as ye primary office; yt. separating fat, in order to
allow yt. several Bowels, to slide wt. ease upon each
other, & to prevent their adhesion, & we readily acc.
for ye. difference of extent in yt. human Body, & in
yt. Quadruped from yt. difference of their intended
posture, as if any argument was needed to prove
yt. Man was not intended to be a Quadruped, we
may remark this, yt. in Man, yt. omentum extends
only to yt. umbilicus, yt. its weight in yt. erect
posture is not sufficient to drag it to yt. bottom
of yt. Belly, But, yt. lignes falling to yt. lower
part, if it had been extended further, there must
have been too great a quantity at yt. lower part
We observe yt. there is an expansion from yt. peri-
toneum yt. sacculi receptacles, & I shall apply this when
speaking of yt. fat situated in other places, as
under yt. skin, In Boerhaave & Haller, we
find several other uses assigned to yt. omentum
as yt. preparing yt. bile in yt. liver, as contributing
to this. Here I would only observe yt. there are
numerous Lymphatic glands situated at its root
which may lead us to regard this use, & perhaps
after all, we shall find room only for admitt-
ing yt. primary use of it. I have mentioned
yt.

yt lubricating yt. surface of yt. several Bowels.

Instead of learning much from yt. appearance of yt. spleen wt. respect to ito use, we are left entirely in yt. dark, we observe blood vessels dividing thro' it, & a vast quantity of blood circulating, we also observe Lymphatic vessels coming out of it, & lymphatic glands in yt. concave parts of yt. spleen, but we do not observe them to be more in number here, or different in their colour from what they are in other places, & as we are unacquainted wt. yt. course, which yt. blood takes from yt. spleen to yt. heart, we leave ito office to be examined afterwards, only from yt. opinion of ito uses we would reject yt. opinion, yt. according to yt. state of yt. stomach, as it is more or less empty, this Organ swells out & contracts, & I would add as a fact, yt. there is no kind of relation between yt. size of yt. stomach, & yt. of yt. spleen, the stomach, when yt. quantity of food in it be small, may be distended wt. wind, & yt. parts of yt. Abdomen being soft & yielding to yt. weight of yt. Atmosphere, there is no need for any such ballance.

We can speak wt. more certainty of yt. use

use of ye Liver as we perceive not only ye division of
vessels in it, but we find a duct vent'ail from it
conveying Bile into ye Duodenum. So ye Liver is an
Org. for ye separation of ye Bile, & ye only doubtful point
here is, whether ye Liver separates ye Bile which
is contained in ye Gall Bladder, or if a secretion is
made from ye proper coat, or whether ye Bile in
ye Gall Bladder is essentially different in its nat-
ure, from ye separated in ye Liver; & I shall after
wards settle this point, wt an absolute certainty.

I would only observe here, yt if ye hepatic
cystic ducts join without ye interposition of valves
or oblique passages, which prevent ye free motion
of ye Bile in any direction, while solid bodies
are obliged by ye ways we find here.

As we end of ye Biliary duct joined
by a duct from an organ called Pancreas, wch
we shall find afterwards to resemble glands
near ye mouth of ye Sow and spittle, from which
we conclude yt ye fluid prepared by it, is em-
bibed by ye name wt saliva. Authors tell us yt
ye pancreatic duct joins wt ye Ductus Com-
munis in order to dilute ye Bile, & at ye
same time they alledge yt ye Bile is collec-
ted

too in ye Gall bladder, yt ye thinner parts may be carried off. We would only say in general yt ye Bile & pancreatic Juice, are both of use in digestion, & serve ye purpose best when blended together. time will be future experience to determine ye office of each & of ye mixture of ye two.

We proceed to consider ye organs of nutrition & Generation, at ye same time demonstrating ye fine muscles, we find in ye Cavity of ye Abdomen.

Lecture 33.

The Demonstration of ye Organs of nutrition & generation Continued.

You have now seen ye 3 principal passages at which Hernia happen viz. the passage at ye Umbilicus, at ye ring for ye Spermatic Cord, & ye passage into ye Thigh.

When we draw off ye Peritonæum from ye Umbilicus, we find yt. there is only a round hole in ye Linea alba, in ye tendons of ye muscles covered by ye Peritonæum, but ye sides not close then by Cellular substance, & you will readily see the reason of ye covering ye Bowels receive here & ye manner in which they will be situated.

Th

the hide in y^e Scrotum is round & very hard, as y^t 5
this species of Hernia, will be more rare than
y^e others, it will grow more slowly, & extend more
equally, so y^e Adhesion will be more firm and
Here y^e Surgeon need only take care to avoid to
wound y^e Bowels, he need not observe y^e direction
to cut in a certain Direction, in order to avoid y^e
Umbilical arteries, or vein, these seldom remain
ing open after two, or three years of age, as
would rather avoid y^e vein, as being of some
use in sustaining y^e liver, but y^e chief Danger
is in wounding y^e Bowels, which we must
carefully avoid. If y^e Bowels protrude at
y^e ring of y^e external oblique, being situated
w^t in y^e body, at y^e fore part of y^e Spermatic
cord, they will generally continue in y^t situ
ation, they will push down into y^e scrotum,
on y^e fore side of y^e Cord, so this species is
named Scrotal Hernia, it has been impro
perly called Inguinal, but this title is more
properly applied to y^e part of y^e Common
species, generally named Crural, Here you
cut upwards, & outwards, the part of y^e
Tendon you cut in this, & more it necessary
you

you could almost slit y. filmes, it is better however to cut them somewhat aslope, in order to give more room, & here there is no considerable part in danger.

The Crural or femoral Hernia, is when y. Bowels pursue y. course of y. femoral vessels behind y. Tendon of y. external oblique. In y. other species, where y. mesentic Bowels are concerned, they push y. Peritonæum before them, but y. vesica urinaria wanting is covering at y. upper part, there is here no coal from y. peritonæum, y.e cannot reduce y. Bowels by pushing them upwards, & a little inwards, we must cut y. ligament of Fallopius, which w.th caution may be cut thus w.thout any unique opening either y. Epigastric, or epigastric vessels.

Now tho these are y. most common species, Hernia may happen in a variety of other places, wherever we feels an eruption out; as into y. Thorax w.th y. Diaphragm torn, or thro a chink, w.th y.e large nerves y.t come out behind from y. peritonæum &c.

From attending to y. situation of

y.

ye Bladder) we readily determine ye proper place for puncturing ye Bladder in ye case of a retention of urine.
Mr. Sharp advises to do it above ye ossa pubis, which is very practicable, but it immediately exposes ye ossa pubis, & slips away from ye Instrument & ye urine gets between ye Rectum & integuments, so it is better to make ye puncture at ye lower part in order to favour ye descent of ye urine, & for leaving a flexible Catheter, without ye danger of ye Bladder's slipping away from it or of hurting ye neighbouring parts. Now some must proceed to enter a curved trocar within ye Intest: rectum, then to bring ye point of it forwards, & so to puncture ye Bladder. But in this way we cannot readily avoid ye Vena deferentia & Vesicula seminales, so a better place will be ye puncturing it at ye side of ye prostate gland, near its centre, which is very practicable, & will enter ye Trocar between ye bulbus of ye Urethra & ye crus of ye penis, then thrust ye very thin lancet in & so into ye Bladder, cutting ye skin w^t ye scalpel for to make ye operation easier to succeed, & then ye Instrument ye direction upwards, and rather

rather keep a little inward in order to strike y. bladder near to its neck.

Sect. I shall make such a cut as I know to be y. most proper in Lithotomy in what is called y. Lateral operation. To guide y. incision, I introduce a furrowed probe, or what is called a staff into y. urethra, till it reach y. bladder. An assistant holds this, while y. Surgeon makes his incision with a common scalpel, where I proposed it, y. best part for y. puncture, between y. anus & y. penis & y. bulb of y. urethra. After dividing the skin & cellular substance, he next divides y. transversalis muscle, & y. levator ani, then he makes a cut in upon y. conductor a little to this part of y. prostate gland, & now taking hold of y. conductor, he can pass a knife or any other instrument into y. bladder, cutting thro' y. prostate gland.

Sect: 3d

After shewing y. structure of y. urinary & seminal Organs, I shall collect some material parts of y. demonstration together in order to explain some mutual of y. uses.

The fluid y. kidney (as) secreted by a quantity

quantity of fat, within the adipose coat, we find
proper coat of y^e kidney, closely adhering to it; & at
y^e concave part inverted, & joined to y^e pelvis, & be-
ginning of y^e ureter. This ties together y^e essential
tubes, & that it appears in y^e adult an uniform mem-
brane, yet it has been in a great measure formed
from y^e cellular substance condensed, & we are fur-
ther to consider it in this way than as an original
coat; because in y^e fœtus, y^e spaces between y^e tubes
are joined loosely by cellular substance. When we
call y^e kidney, we find what is called cortical
substance, but y^e name is only proper when it is
applied to each of y^e original tubes, for, their growing
together, what is named cortical, is very deep in
in y^e substance of y^e kidney, so it is better to
call this y^e Vascular secerning part where y^e
vessels are filled for making y^e secretion. Within
we find y^e substance called Medullary, which
from is bounded from y^e next substance y^e brain
has to y^e kidney, it is better named tubular
uniformous. The several minute tubes are
collected, & join into larger, & a great number
at length join to form any one papillar, & this
papilla hangs within y^e pelvis y^t conveys y^e
urine

urine towards ye Ureter called infundibulum. The intention is to prevent ye urine from regurgitating so this structure varies ye purpose of a Valve, as ye more you distend ye pelvis of ye kidney, ye more ye sides of ye tubes are squeezed together. As ye number of original tubes varies in different subjects, hence we find a great variety in ye number of papillæ, & still more in ye number of infundibula. Often two or more papillæ are inᵗ in one infundibulum, so we are not to receive ye common description of ye way these join to form ye pelvis as taking place without variation.

From ye part of ye pelvis projecting behind ye concavity of ye kidney we see ye ureter continued, & we see a possibility of cutting into ye cavity without wounding ye kidney. But ye incision must be made very deep, a great many muscles wᵗ ye common teguments, & a quantity of fat must be cut thro' & after all, on account of their size, & ye shape of ye pelvis, you could not easily extract them. I do not say yᵗ in no case an operation of this kind is to be done, but at least there are many things to discourage us from ye attempt.

From

from y. size of y. pelvis compared w.t y.t of
ureter y.t motion of y.t urine must be slower in y.t
former, so Calculi are apt to form there, & from their
size & y.t want of y.t it's a longe they may not
readily pass. But, supposing them small, y.t
ureter is unequal in size in different places,
so they are apt to stop, or they descend often w.t
very great difficulty. There is one contracted place
at y.t verge of y.t pelvis, from y.t juncture & y.t be-
ginning muscle, & anoy.r great contraction, where y.t
ureter enters y.t bladder, so y.t stones may some-
times stop here for a very long time, & produce
fatal symptoms. In y.t. Male y.t place is scarce
to be reached w.t y.t finger, but in y.t female
there is room for an operation, which I shall pro-
pose & explain. The Ureter in it's whole course
is a muscular organ. It is strange y.t Haller
& others, will allow themselves to be misled by
Theory & Analogy. Haller supposes y.t y.t skin
is reflected from y.t Glans penis to form y.t ure-
ter, but y.t ureter is composed of a cellulous
membrane on y.t outer side, how y.t same
membrane w.t y.t bladder on y.t inner side
w.t many ducts pouring out mucus, that ure-
ter

cannot

can't see them distinctly, & there is between these & y^e 17
brown Coat, which is evidently muscular, I have seen
an evident & large action of it in living Animals
on touching y^e Ureter, we see the motion like a
worm, not only altering its Diameter but its place
& this Circumstance explains y^e use of spasm in
Calculous cases that by lessening y^e irritation we
remove y^e Constriction of y^e ureter, on y^e y^e urine
more readily pushes on y^e stone.

The Structure of y^e Bladder agrees
w^th y^e of y^e ureter. It's fluid y^e muscular fibres
disposed in fasciculi, & y^e internal membranes
appearing between these; & this membranes is
very dilatable, accomodating itself to y^e distention
ion of y^e bladder, & we may understand how
bags are formed here by Calculi, y^e urine coal
lasing out between y^e bundles of y^e muscu-
lar fibres, forms a Hernia, so y^t Surgeons may
find a great difficulty in cutting y^e Calculus
When we trace y^e course of y^e muscular fibres
we find them matted together, so the fibres
fibres fitted to contract y^e bladder in all di-
rections, which they do w^th y^e utmost accura-
cy, and reflecting upon what happens in

y^e

y^e Alimentary Canal, & Uterica urinaria), it is evident
y^t Physiologists have been misled in confining y^e
contraction of muscular fibres to one thing. As
y^e Bladder can contain scarce a pint of urine, or can
contract so as not to leave a single drop within
it, so y^t y^e power of contraction here must be
very great, or instead of shortening one thing
they do it to y^e ends of their former ways. In like
manner in y^e Alimentary Canal, y^e contraction
of y^e muscular coat is so great, y^t y^e sides touch
together, so as to push Mercury before them in
all y^e different directions of y^e Viscera and
Further we find no distinct existence of y^e bladder,
(or), but y^e same muscular fibres continue
surrounding y^e rectum, & in some part y^e vessel
only of y^e same fibre we see in order to fully
effecting w^t y^e whole at once, we can find out
w^t y^e portions of y^e fibres, y^t expell y^e urine
& then w^t y^e other end, & prevent y^e urine from
flowing. —

Afterwards we dissected y^e Canal
common to y^e Seminal & Urinary organs, there
first we kept examining y^e assistance of y^e bodies
& traced y^e semen from them towards

(w)

In these parts we shall observe little at present
We observed y^e testicle of a foetus inclosed in a Vagina,
capable of confining air in some measure, but
not entirely. Hence we find Tocal proposes y^t
y^e Spermatic Cord. When at y^e bottom we find a
shut sack, y^e Vaginal Coat, which seems to have
no connexion w^th any other cavity, we shall after-
wards trace it from y^e peritonæum, but at present
we consider it as inclosing y^e testicles, and serving
y^e same purpose to them, y^t y^e peritonæum does
to y^e Bowels, they are supported & defended by
it, & allowed to slide easily. & in proof of this
we shall find y^t y^e testicle is originally w^thin
y^e Abdomen, & while it remains there, it wants
y^e Vaginal coat, y^e peritonæum supplying its
place. . Next we find y^e Tunica Albuginea cov-
ering y^e testicle, & we may trace y^e vaginal
coat over y^e Albuginea forming another
layer to it. so y^t y^e tunica Albuginea is first
a continuation of y^e Vaginal Coat, but besides
there is a proper coat of a particular whiteness
& great strength, w^ch serves to conduct the
vessels to y^e testicle. These two Coats are
next covered w^th y^e Cremaster muscle, w^ch not
only

only ovulation, but serves to agitate & compress ye testes
& to promote ye secretion as well as ye expulsion of ye
semen. Over all we find a Cellular substance connec-
ting these coats to ye skin. This is loose & without
fat, which might compress ye testes too much, nor
there is semd reason to believe yt ye fat may be
wanting, in order to admitt of a contractile power
which ye skin in general possesses, but which is
most remarkable in this place, & this part of ye
skin is more or less contracted, or loose, according
to ye quantity of semen in ye Vesiculæ Seminales
which shows that there is a muscular power by
which ye change is produced, as ye semen is con-
ducted from ye Epididymis to ye vas deferens
& by these to ye Vesiculæ, from whence it is com-
veyed into ye beginning of ye urethra where ye
liquor of ye prostate gland is poured out. The
next opened ye urethra & vas ye glandes of Cowper
ye use of which is not very well known. Within
ye urethra we found ye mucous ducts with ye
orifices turned towards, ye plain use of which
is to defend ye canal against ye acrimony of
ye urine. & they are discovered with ye orifices standing
to ye mouth of ye urethra, yt ye urine as it comes

Forward

forwards may easily flow so it proves a defence to ye 16
(cuts of their motion, as well as to ye membranes
in general, you have seen ye Common substance
of ye bulb forming ye Glans, & shown you ye ex-
ternous substance forming ye body of ye penis
which (as not communicate w^t ye glans, there
is a Septum betweene them, & ye cells containing
ye blood are confined by a membrane of great
strength & elasticity. The manner in which ye
penis is distended can only be understood when
we have seen ye Course of ye vessels.

Sect: 35. Thorax

We now proceed to examine ye Structure & con-
tents of ye Thorax.

We may blow up ye lungs very readily by
meane of a short pipe introduced into ye Windpipe
ye extremity of which is of a conical shape, so as
to fill ye mouth, & as ye force with which one
expires is very considerable, we very readily in-
flate ye Lungs by blowing them such a tube &
(tho it is not) necessary to use a pair of bellows for
this purpose. By means of air & from going down
into ye stomach, we make a pressure upon ye

Diaphragm

œsphagus at y. bottom of y. Stomach, when y. cartilage makes a compleat circle, whereby y^e do not prevent y^e air from going down into y^e lungs.

It is also practicable by a tube to throw liquors into y. stomach, as in y^e case of a paralytick of y. throat. We pass a common Catheter down to y. œsphagus, & applying a Syringe, we can throw any determined quantity of liquor into y. stomach & we need not take more time than can be allowed by interrupting y. breathing.

Sect. 36 The Demonstration continued.

Sect. 37

We have now examined, so far as can be done merely by Dissection, y. Structure of y. heart & y. lungs, & of y. containing parts, let us now consider their general use & motions.

As y. heart is y. centre of our New. curan System, which we are afterwards to consider very fully, I shall at present confine myself to a few observations respecting it as a muscle, & serving to explain more fully y^e demonstration y^t has been made, & y. most general use

wee after this manner.

The first of these incisions is made into the large capsule, to the pericardium, & this we observed was first done in the place, first by the pleura where they join the Mediastinum, then we find it more loose about the middle of the diaphragm, the more so then from observing this to consider of the pericardium, we made the fit of the heart in its place to prevent the weight of it from drawing down so much of the fore part whether veins, or Arteries going into or from it are also from falling to the side ventricle, as to the lungs, or other organs in the performance of their functions, when we open the pericardium, we find it well filled for this purpose by its strength. We next observed it passing over the closely connected to the muscular fibres, in order to prevent the impulse of the blood, & to contain the blood in the heart, & this reflexion of it may be the further purpose of preventing the base of the heart from being rubbed against the cost. capsule, which would have fretted & irritated them, & the whole inner side how are over spread out upon it, by which it slides & plays the more easily. We next attend to the vitus

situation of y^e Heart, & we found it in y^e human 10)
Body, It is semeuntial of y^e shape of a half cone but
almost transversely — y^e flat side upon y^e Diaphragm, & y^t y^e parts named right & left shd
rather be called Anterior & posterior. It is evident
y^t every part of y^e heart, y^e Auricles & ventricles are muscular, & cutting into y^e heart
we find y^e muscles lined w^t a very thin but a
very dense membrane, which evidently serves
for containing y^e blood. Nor we observed y^t y^e
texture of y^e heart is very close, y^e fibres are
by no means seen so distinctly as in y^e large
muscles, & they are more closely joined together
by cellular substance, & this close connexion also
serves to prevent y^e blood from passing out
between y^e fibres, when y^e inner membrane
is lacerated, & from y^t difference of texture
there appears to be a further real difference
in y^e nature of y^e substance, y^t it is more
highly sensible & irritable, & y^t it possesses
vulcan powers of contraction. For this power
is very different in different muscles, acc.
ording to their use, so y^t it is usual w^t
Physiological Writers in general to place

a

a certain bounds or limit to y^e contraction of muscles
thus y^e hollow Mounts within y^e pelvis possess so much
greater powers of contraction than y^e contrary
parts do.

We next traced y^e several parts, & following
them in y^e order, in which I shall prove y^t y^e blood
is moved, we begin w^th y^e Venæ Cavæ. The meeting
of these, called Sinus Venosus dextri, is cover'd by
a muscular substance, & y^e ends of y^e cavæ partici-
pate of y^e same structure, possess y^e same power of
contraction w^th y^e heart. Joined to y^e Sinus we find
an appendix proceeding from y^e heart named auricle
& we distinguish between these merely by y^e dis-
position of y^e muscular fibres. In y^e Sinus y^e
fibres are smooth within, whereas in y^e auricle
there are a number of Columnæ carneæ w^th valves
& foveæ; yet at y^e same time we are to consider
y^e auricle & Sinus as making one & y^e same cavity
which is filled & emptied at y^e same time. Nor
there is no real value, or partition between
them, & y^e left Sinus is much larger than y^e
right, & y^e left Auricle is much smaller, or
lesser to y^e left vide, y^e auricle is an in-
considerable cavity when compared w^th y^e Sinus.

Going

upon further inquiry we found y. ventricle of y. same year obtuse w.t y. auricle, yt. it has columnæ carneæ w.t furrows & pits between them, or y. in general y. heart has this structure. The several pillars receiving y. blood between them, when thereunto action, agitate it more violently, & in this way some particular purposes. Where y. auricle joyned to y. ventricle, we observed a ring of a dense substance from which y. fibres, & y. auricle begin, & tracing those we perceive a most beautiful structure of fibres, mostly oblique, some w.t others yt. are transverse, & we found w.t in y. ventricles yt. y. opposite sides were joined w.t pillars, or yt. y. heart is calculated to keep all its dimensions, It was supposed to become by drawn down, so to become longer, This molestre arose from observing yt. when y. ventricles are acting y. joint substances y. sides. But that depends upon this, yt., whilst y. ventricles are in action, y. auricles behind are filling & bring them forwards, but y. chief business place upon which this depends is, yt. y. heart when y. ventricles are emptying make a turn, moves upon its basis, where it is

tied

tid auri by y. infide, ou ufu u amazon, y. pain
pilio forwards bluccn y. lua bloo of y. lungon
y. left vide, & it in cudeul it in bfoned in all
ilo dimensions.

At y. joining of y. Auricle & Ventricle
there in a Value which some mian a compleat
circle, it is named tricuspis, but y. name of
circular would convey a more exact idea of it
We find this connected to y. side of y. Ventricle
by 3 thin pillars, which have tendinous cords
connected to them. The use of y. Value is only
to hinder y. regurgitation of y. blood, but y. use
of y. pillars is not so evident, it is this, when
y. heart is in action, y. pain of it appreaching
ilo brain, if y. connexion had been made by
membranes, they would have been turned in
side out, thrown back into y. Ventricle, so
would have allowed y. blood to have been
thrown back into y. auricle. It is ridiculous
to suppose y. three pillars were to open y.
value. After y. ventricle has ceased from
action, y. blood makes way for itself, & it
is besides pushed on by y. action of y. Auri
cle. This Value then directs ilo motion

towards

prevents y. return, & when y. Ventricle is in action
y. blood is thrown into y. aorta & from into y. pul-
monary artery. & here y. return is prevented by y.
Semilunar Valves, two are formed by y
doubling of y. internal membrane, & at y. (doub-
ling) there is a small substance, which never
to shut y. very middle of y. valve. Then y.
blood returning by y. pulmonary veins enters
y. left side of y. heart where meeting y. veins
have pulmonales opened. From hence into y.
left Ventricle the return is prevented by y. valv.
bi mitralis & it passes on to y. Aorta, & here
again the return into y. Ventricle is prevented
by y. Semilunar Valves. Soure have now y. flow
of y. blood in y. circulation it describes, for y
blood is now carried by y. Aorta to all y. (differ-
ent) parts of y. body, & is returned again to y. heart
by y. Vena Cava.

We next turn our attention to y. Lungs
& y. motions of y. Thorax, & here as we can neither
follow by Dissection y. blood in y. small
ramifications, nor even trace y. air to y. ul-
timate termination, we shall speak of y. struc-
ture of y. Lungs in y. most superficial
manner

motions which are performed. When we feel
tracheæ arteriæ, we find another sinus mu-
tuare, & between these cartilaginous rings the
which encompassing behind membranous & fleshy
the want of cartilages in that portion, will be
easily explained, for the oesophagus & tracheæ
mutuo vocem for the Oesophagus, & descent of the
food & nisus of the thorax to be compleated in
different places for respiration & formation
of the voice, that the same time of formation
vocalibus & respiration. Palatum & tracheæ
with the tongue, as also it divides what is
to below & of the sinus into two branches, these
of segments of the cartilages are more regular
we now find them behind as with respect
in human fœtus we find one hole, even with
perhaps of the viscid descended, but still they
are continued to keep the tube free from com-
pression. The trachea has evidently a muscu-
lar structure, but of more muscular branches
assisting as epiglottis muscles & these of the
vocal tube terminate in the cartilages
When we blow in air, we find the cartilages
into

ink small tubules, which again conduct it to the
last joint, where it meets there in a vessel opening
into any tube, i.e. if Cells or ultimate branches com-
municate. The two joints of feet are covered
by a proper membrane, & then by y. pleura, & the
Cellular substance. The proper membrane is
y. fine mater of y. brain, & is called between it
& tubules, whereas y. pleura like y. muscles
coat, passes from one tube to ye. The Cellu-
lar substance interposes communicates y. proper
y. Cellular substance y. two y. pleura & is
round y. division of y. trachea, as in most
insects colours glands called pancreas but y.
use of which is not determined & what
secretion to receive it afterwards, or what
we may expect will certainly answer it.

Last. To endeavour to prove y.
y. y. lungs in a dead, a quiet one in a living ani-
mal, are every where contiguous to y. pleura
& they perfectly resemble y. containing parts
in thoy. & often give them in dissecting
groups to y. side. That this connection is
universal & lastly in every case, & animal
when we dissect carefully y. external mus-
cles

Upon making a hole, they immediately collapse
& y^e. heaven is very evident; it is owing to y^e. weight
of y^e. air; y^e. effect it has upon our bodies, or upon
y^e. surface of y^e. earth, this single point must
be mentioned only, & then y^e. cause of y^e. certainty
is perfectly evident. You have seen y^e. proof of
y^e. weight of y^e. air in y^e. common Instrument
y^e. Barometer. Thus if we take a glass tube, 3
feet long, shut at y^e. one end, & having y^e. open
end turned upwards, & filling it with Mercury, & give
it perpendicularly, y^e. Mercury will separate
from y^e. top of y^e. tube several inches, but is sup-
ported about y^e. height of 28 inches, measuring
it accurately, it is in y^e. long tube 28 inches
higher, than it is in y^e. short. Now we cannot
can find no other reason for its not running
out, but y^t. y^e. weight of y^e. air upon y^e. surface
of y^e. Mercury is equal to y^e. weight of y^e. Mer-
cury in y^e. longer tube, or supposing any ex-
cavation of y^e. Mercury to y^e. tube; if we make
y^e. same experiment w^t. water, it will require
a tube of about 30 feet long, we then are
in y^e. same state, as if earth was covered

to

& y. depth of 30 feet wt. water. . Now making y. 2d
substitution of y. one fluid for y. other; it will
appear evident, y. by ye weight, it would much
pain our throat, & distend y. lungs, & put so them
contiguous to y. containing parts, & if we un-
derstand how y. lungs are contiguous in any parti-
cular state of respiration, we understand y. they
must be so in every state of respiration; Suppose
y. I have just now made an aspiration, & y. I
dilate my Thorax, more air will run down y.
trachea, & still keep y. lungs contiguous, in thus
viewing their dilatation, we may consider them
as being altogether passive, & are merely pulled
y. motion of y. containing parts. With regard
to their dilatation, this is perfectly evident.
wt. regard to their contraction, their power must
be very inconsiderable, their muscular fibres
being extremely thin.

It remains then to explain y. motion of y. containing parts, how by y. action of
these y. Thorax can be enlarged, beginning wt.
y. action of y. Diaphragm. When it
comes towards y. Thorax, & in its middle
we find a tendon y. lies it to y. Mediastinum

&

& by perpendicular, but from the place by. viz. the Thorax, yt. Diaphragm is perfectly free from motion, when it is drawn into action, it alters from a crooked to a straight line, & as its circumference is nearly immoveable, it must push down yt. Abdominal bowels, & elongate yt. Thorax, there is likewise a certain degree of elongation in yt. middle, & horizontal motion given to yt. sides of yt. Diaphragm, but yt. video of yt. Diaphragm move chiefly, & by means of this yt. Abdominal bowels are made to act, & yt. Abdominal bowels universally compressed, as yt. Abdomen is made shorter. Next yt. Thorax is enlarged by yt. motion of yt. ribs, & these when moved have a double effect, for the Sternum is lifted forwards & brought to a greater distance from yt. spine, hence yt. depth of yt. Thorax is increased, & this is owing to yt. oblique situation of yt. ribs, their being placed standing in yt. Thorax.

Next yt. distance between yt. ribs is increased, they are drawn outwards, partly owing to yt. elasticity of yt. Cartilages resisting yt. motion, hence by yt. motion of yt. ribs, yt. Thorax is increased in depth, & in breadth

me

we can enlarge y^e^ thorax in all y^e^ dimensions in which it is possible to move any solid substance.

It only remains y^t^ we determine y^e^ part in which y^e^ abdominal muscles have principal strength, for this will very much facilitate the motion of y^e^ whole body, & y^t^ we may rightly understand y^e^ use of the two rows of intercostal muscles & y^e^ two rows are given because of y^e^ obliquity (as hath been y^e^ only difficulty can be removed with y^e^ greatest ease, & one general point of much consequence in our body is explained by it, namely y^e^ great end which oblique muscles have in performing a more extensive motion, than is possible by means of straight fibres. Thus suppose a large flexion of y^e^ body is intended, as y^e^ hand to draw down y^e^ arm, y^e^ oblique may act very near to y^e^ perpendicular, y^t^ can be very well done by y^e^ muscles really, supposing y^t^ these are 12 inches long, & y^t^ they shorten 1/5, or y^t^ when y^e^ really move to y^e^ perpendicular endeavours is breadth, were two inches. But suppose we use two oblique muscles of y^e^ same length, & y^t^ they contract in,

in ye same manner, ye cartilage will now be brought a great deal lower, ye obliquity of ye one, balancing ye obliquity of ye other, ye cartilage move in ye diagonal line between them, & instead of moving two inches only, it may be made to move 8, that is three more than it did formerly. . how with respect to ye intercostal muscles, their large motion depends upon this entirely, ye spaces are so small ye straight fibre could not have room sufficient to play, but here is an obliquity. Further if there be two only one pair of oblique fibres, if the muscle was either too much forward or backward, ye motion would not have been equable but by throwing in two pair, ye first motion is performed, & ye motion is perfectly equable, ye nine moving parallel to each other. And as ye upper ribs are more oblique than ye under, when ye intercostal muscles are in action, there is a general motion upwards, ye under ribs move towards ye upper so as to bring them nearer together, by which means ye cavity of ye thorax is enlarged in all manner

little concurrence with y motion of y upper rib
may excite upon it than all move in y same
direction.

If y interior part of y external intercostals are wanting & y internal are wanting behind
y heaven of thin is perfectly simple, if y external
had been subject to y Mercurii y tool
fibres would have been fixed to a less moveable
bone below & to a rib above therefore instead of
assisting in raising y rib, they would have
pulled them down, hence as soon as y external
intercostal muscle approach to near y know
their obliquity y fibres would have been in dan-
ger of influencing y upper rib more than y
under they are take aside, they are carried no
further, by y internal intercostal muscles
y respiration is reversed, in consequence
of their direction, & y angle which y rib
make w^th y vertebrae, they would have come
at length to influence y upper rib more than
y under, when they would have not only been
useless, but even hurtful. From this we
are enabled to repair an error which has
crept in, y^t y external & internal muscles

tak

tal muscles are antagonists to each other, y. y. ex-
ternal levate y. ribs, while y. internal depress
them, whereas it appears from this y. they are
intended to co-operate; & without using further
arguments, I have seen y. co-operation in turn
Animals, & it has been long ago very justly
observed by L. Bacon.

Now after knowing y. general effect
of y. Intercostal muscles, & of y. Diaphragm
of course of dilatation of our Thorax, we will
also understand what is done in y. time of respi-
ration, after a short space we grow uneasy
from y. distension of y. lungs & obstruction
becomes necessary. But when we expire, we rest
w.t less muscular power, y. elasticity of y.
parts assisting very greatly to replace them
When we lie in a horizontal posture, as soon
as we receive from atmos.r w.t y. Diaphragm
y. very weight of y. Abdominal viscera (dis-
tended w.t gaseous air) w.t y. reaction of y.
Mediastinum, which is put upon y. stretch
does somewhat to replace y. Diaphragm
& y. elasticity of y. cartilages of y. ribs repla-
ces them, but we expire still further w.t
y.

yt. Abdominal muscles, when yt. Diaphragm descends; it pushes them gently out, & as soon as yt. Diaphragm is relaxd, ye push in yt. Abdominal muscles, & replace yt. Diaphragm by yt. means, & as yt. external & internal oblique, are connected to yt. edges of yt. ribs, they are drawn down at yt same time, some fibres of yt. muscles are immediately intended for yt. purpose of respiration, as yt. triangularis Sterni, which serves to pull down yt. ribs, & we find at yt. roots of yt. ribs two serrati muscles, one at yt. upper part, serving to raise yt. ribs, & yt. other at yt. under part serving to pull down yt. undermost rib, which stands yt. more in need of a muscle for yt. purpose yt. they want yt. connexion of yt. sternum by intermediate cartilages. Knowing yt. usual respiration, we can understand every modification of it, as sneezing, coughing, laughing &c. sneezing, yawning &c., we needonly to perform those motions slowly to understand yt. manner in wch. those muscles act.

Expt. we understand ye use of yt. Mediastinum, & mend made into yt. Thorax

of ye wound, hindred ye air to get into ye thorax
of them from ye outward applied to ye outermost of
ye lungs, as well as to ye inner, & their natural elas-
ticity causing them to collapse, but ye danger is
lessened by ye Mediastinum, Now wound only
made, ye Air has not access to both sides, one only
is affected. But besides as our two lungs are
joined by one common pipe, ye Trachea arteria
ye motion of ye one side assists ye other, & ye mo-
tion now in ye wounded side becomes compleat
but it is very easily understood. When a Wound
is inflicted upon one side of ye thorax, ye lungs
on ye side endeavour to fall together, & ye inna-
te from an instinct of nature endeavours
to prevent this, it makes a full inspiration
whereby ye wounded side is dilated more or
less, next ye Animal makes ye expiration
wt equal violence employing several expe-
dients, which we can occasionally bring into
play; & during this expiration, there is an
evident contraction of ye glottis, it does not
allow ye air to get out, but by an instinct of
nature shuts ye Glottis, so yt ye air passes
from ye sound side into ye wounded, when

therefore

therefore if one side of ye lungs is acquiring, ye other is in ye state of dilatation; & by ye means ye air can be prevented that ye wound is considerable.

We next proceed to demonstrate ye muscles of ye Mouth & Nose, as also some in ye neck.

There have been violent disputes abt ye action of ye Depressor Muscle, When we open ye mouth, it is slackened, & Albinus justly contends yt it is one of ye Muscles, & Winslow one yt pulls down ye lower Jaw, but when we prevent ye Depressor from opening ye jaw by acting w^t ye Temporal & Masseter muscles, it assists in swallowing, as soon as ye food is prepared, we shut ye mouth, press ye jaws together, & pull up ye os hyoides w^t this muscle, as Albinus has owned in denying the office in this particular.

Lect: 38

We next allude to ye co-operation of ye several muscles demonstrated, & we begin w^t ye muscles of ye face. Here you will observe persons a double office. 1st They are intended for ye expression of ye passions, & 2dly remoned yt from

ye

y^t reason of y^e thing; we would be led to say, contrary to y^e late D^r Parsons, y^t we do not acquire y^e power of expression by habit, but y^t we be admitted, as y^e minds of Men vary originally, so we would suppose y^t y^e muscles of y^e face (de volitionibus &c.) Which we may further attend to two circumstances in proof of it. One is, y^t y^e faces of Children vary in expression very greatly. Next we may observe y^t no two of y^e most accurate Painters agree in y^e description they have given of these muscles, & I have observed y^t there is a natural variety, but w^t all being allowed there remains still y^e question about it. What habit however how its influence must be acknowledged, this appears from y^e variety in expression among Men of y^e same profession, & who are intent upon y^e same objects, which make at last an indelible impression on their features.

We next attend to their more simple operation in shutting, or opening y^e mouth. If y^e several muscles said to raise y^e lips or to draw out y^e corners of y^e mouth, acting at once open y^e mouth fully. We next endeavour to open y^e pairs, & we (as this chiefly by

y^e

y^e motion of y^e ante-Cum but not entirely y^e same of y^e
lower part is prevented from motion, wch can never
y^e whole heart & in y^e way influence y^e pericardium
naturally however not only w^t y^e muscles of y^e
under part & by the y^e ligaments w^t brings
part, but along w^t y^e w^ch may employ y^e Right
& y^e genii hyoidai, & under y^e notion of
y^e pericardium we draw down y^e two hy-
oides by y^e muscles from y^e sternum & clavicles
& sternum, wherby we alter y^e angle of y^e
ligaments, it is known al agreeable Angle unto
y^e jaw. but we shall y^e jaw & make them
play upon each other by y^e action of y^e masse-
ters of y^e temporal, & y^e two pterigoidai, more
over of y^e temporal, & y^e two pterigoidai, more
over y^e jaw upward, w^ch some degree sideways
y^e masseters draw it upwards, somewhat
forwards, & pterigoid upwards & a little in-
wards; so these two when in action make
y^e jaw ascend, & join al y^e same time
some degree of bulk of y^e one upon y^e other
When we are acting thus w^t y^e jaw bone
then is necessarily y^e y^e jaw cheeks become
lines on y^e outer side, by means it from
getting between y^e cheeks, & gums, & do

this

this muscle wth y. Buccinator, thereby y. mouth
y. mouth wth y. Orbicularis, whereby y. whole
surface is closely applied by y. surface of y.
teeth & of y. Gums, you will observe y. y.
Orbicularis possesses a very extensive contra-
tion, soas thereby all y. Impress of both maxa
into y. mouth, & y. next moment soas entirely
shut y. mouth, so this muscle molcae of shor-
ning one third, shortens to a third of its length
Further y. fibres which shorten y. mouth in
a great measure join it, y. is we not only
see wth single Lenses, but wth posture of
y. same fibre at pleasure. Aided by means
of these muscles, avoiding others mentioned
by Bartholine &c., we prevent y. food from
escaping outwards, we confine it in y. mouth
also by y. action of y. Tongue, which can be
varied in all circles at pleasure, in more
circles than appear possible from a view
of y. muscles, without taking into account
y. power which y. tongue possesses, y. ex-
tremity of y. fibres act at a different
time & in a different manner from their be-
ginning & their direction can be altered at
pleasure

After y. food is sufficiently prepared for being swallowed, we convey it back into y. throat, by laying it on y. tip of y. tongue, then drawing y. tongue backwards by means of y. Stylo-glossi muscles, wc. at y. same time make it broader, & excavate y. point by y. action of y. fibres, which compose its substance, chiefly by y. linguales, whereby y. point is pressed upon y. palate, & by y. assistance of y. rugæ, it readily passes to y. root of y. tongue. While y. tongue is drawn back y. ligament connecting it to y. Epiglottis comes to be relaped, & y. Epiglottis is mechanically pressed down upon y. top of y. Glottis, & now a new action begins, by an involuntary nature, sensible of y. danger, we shut contract y. Glottis itself & find I can shut y. glottis most accurately. Next we endeavour to get rid of y. food, which now stops our respiration, by (drawing y. parts upwards & forwards, & we are solicited to cover y. Glottis still better by y. imitation communicated to y. Uvula, I do not know of any Anatomist who gives a distinct acct. of y. use of y. Uvula; it appears rather an imperfect

impediment, but it is partly removable by hand in
it general motion is excited in y^e Throat, so it is
hurtful there are a number to oblige us to perform y^e
contraction which shuts y^e Glottis, in throwing y^e
food over y^e Tongue. So y^e Uvula is maintained
in y^e Quadruped, where from y^e horizontal posi-
ture there is not y^e same danger of y^e food passing
into y^e Lungs. We then raise up y^e Glottis by y^e
Constrictores isthmi Faucium, & pull forward
violently y^e os hyoides w^th y^e whole Tongue, & while
we are attempting to swallow, y^e Larynx and
the present y^e muscles from pulling down y^e Lar
y^e, there whole action may be upon y^e os hy-
des we act w^th y^e genio hyoideus & mylo hyoideus
& add w^th y^e Digastric, which is at y^e same
time thrown into a convulsion w^th a sudden vio-
lence, we now throw these muscles into sud-
den action, & draw by means of them y^e Tongue
forwards. Thus we throw y^e food towards ward
& at y^e same time prepare y^e space for it, because
y^e back of y^e Tongue makes y^e fore part of y^e
Pharynx, or y^e part behind is dilated for
y^e reception of y^e food.

Then y^e food is pushed behind y^e

Epiglottis

& pglottis; there is danger of ilo passing upwards into the
y. nose, & this is not prevented by our velum
merely, for if y. palate is excee, as in y. Ducs throat
ea, y. food & y. drink get into y. nose, & we can
swallow even liquids, when standing on y. crown
of y. head, as this is prevented by y. great power
which y. levatores palati have, by which y. palat
is applied in an accurate manner to cover y.
back of y. nose.

The food being thus thrown wt a consider-
able force into y. Pharynx, y. organ is excited to
act, & is rendered shorter by y. palato Pharyn-
gæi muscles, which lift it upwards with
& at y. same time dilate it, y. distance between
y. Stylois processes being greater than y. Diameter
of y. Pharynx, these muscles must dilate it.
Then y. Constrictores Pharyngis are thrown
into action, & by an instinct of nature, y. motion
is determined from above downwards, till y. food
enters y. Oesophagus, & we now relax y. parts, y.
being no danger of y. food ascending again
but if we are to thrust it in wt greater vio-
lence, we can draw y. Os hyoides, & Larynx
backwards by y. two hyoidæi muscles, & we

pass

vce y. reason why Muscles go from y. Scapulæ to
y. Os hyoides, they serve to pull y. tongue back-
wards in y. deglutition. By these means
y. food is thrown into y. stomach wᵗ more accuracy
& wᵗ greater quickness than coud ever be
in animating Animals, as in y. Cow, y. hay
passes so quickly from y. mouth to y. stomach
y. we scarcely see it in y. Throat, & we no doubt
possess similar powers. We can also force air
into y. stomach, when y. head is inverted, i.e.
y. sides of y. Oesophagus are brought to touch
as we can push air into y. stomach, & I am very
much persuaded y. persons who have weak sto-
machs, add often much to their discomfort by swal-
lowing a great quantity of air; they complain
of wind, & a great deal is discharged by belching
& y. whole of it is not from food. I have
attended to several who were in this situation
they find an uneasiness, y. food becomes sour
& they make an attempt to free themselves
of y. uneasiness, but they add to it by swallow-
ing down y. air, & I am at present troubled
with a quantity of air, y. my stomach is in
(danger) of being burnt by it. While exploded
air

tion is thus performed ye. salivary glands are at ye.
same time agitated in a way ye is proper & most
from their situation a much greater quantity of
saliva than ordinary is poured out in time of eat-
ing, thus where wounds have been made in ye
parotid Gland, ye quantity is such yt not on-
ly ye operation, but ye secretion of ye liquor wou'd
appear to be increased. In like manner in ye
throat mine is added by ye pressure made
ye tongue & Amygdalæ, & this is done chiefly
by ye action of ye Convolutores & Pharynx.

Next wt regard to ye reverse motion
Vomiting, we generally get from Authors a
very wrong account of this, They suppose ye
ye stomach first has its muscular action inver-
ted, & this does sometimes, but it is surely
not sufficient, neither they imagine ye ye Dia-
phragm & Abdominal muscles are at ye
same time thrown into a Convulsive action, &
yt ye stomach is pressed between them. But
in this case ye air rushing into ye lungs wd
meet ye liquor from ye stomach, & both wd
be thrown into ye lungs at once. The action
of ye Diaphragm precedes ye action of ye

Abdom

. Abdominal muscles, & after we have filled our lungs w.th air, making a certain resistance w.th y.e diaphragm, we throw y.e Abdominal muscles into action, & allow them to overcome y.e Diaphragm so y.t water & air are thrown out at y.e same time.

Lect: 30th

It is of use to observe y.t y.e tongue is long enough to be passed into y.e throat, & y.t we can touch w.th it y.e back of y.e Septum narium, so y.t we can examin y.e connexion of humours in y.e throat, we can also feel w.th y.e tongue y.e Epiglottis, so inclosing it between y.e tongue & y.e roof of y.e mouth y.t it is getting down into y.e stomach we can enter a Catheter directly into y.e trachea, & y.t w.thout hurting y.e parts of y.e tongue, Thrusting y.e fore finger of y.e left hand at y.e right corner of y.e mouth, till we feel y.e Epiglottis, & placing y.e finger upon y.e back of it, we enter y.e Catheter at y.e other corner of y.e mouth, & in this way it is perfectly easily done, but as by doing this in a hurry, we may be in danger of tearing y.e ligaments, it is better to inflate them from y.e Nose.

y.e

Followed y. m. Manducation & deglutition y. numerous small salivary glands are compressed. When we open y. mouth y. muscles in action press y. inferior maxillary glands, & y. Sublingual, while y. tongue pressing them from sliding y. effect of these muscles; at y. same time y. fauces being pushed back press upon y. parotid glands, y. ducts of which are pumped by y. masseter muscles the chime is also poured out from y. Amygdalæ from a number of orifices which communicate w.t each other, they are compressed by y. food passing thro y. isthmus of y. fauces, & y. chime comes to be mixed w.t y. Bolus, you will observe further w.t respect to y. Amygdalæ, y.t y. chime is often inspissated in their receptacles, & appearing at y. orifices has often been mistaken by Physicians for ulcers in y. throat; & as a dangerous nature, when in reality there was nothing very dangerous in y. case.

We impl. y. minute y. muscles of y. Tongue.

All Anatomists agree y.t y. voice is formed at y. Larynx, & y.t in whose y. voice into bellows by means of y. ligament to

of

of y^e Larynx; as it passes thro' y^e mouth, it only remains to determine y^e particular way in w^ch this is done.

Till of late y^e Mons^r Francini an ingenious French Gentleman wrote on y^e subject, Authors spoke concerning y^e formation of y^e voice in a very vague & undetermined manner, he first endeavoured to throw light upon y^e subject by experiments. Before him they generally conceived y^e Voice to be formed by y^e Larynx, considered as a wind Instrument, instead of which Mons^r Francini contends y^t our Larynx is to be considered as a corded Instrument acted upon by y^e wind, Now, y^t y^e distinction may be fully understood, I would observe y^t in y^e wind Instrument, as a flute, y^e tone depends not upon y^e material of which y^e Instrument is composed, but upon y^e thickness of y^e air of y^e Instrument, & of y^e different lengths from it, thus a number of flutes made of very different materials, of lead, Copper, wood, glass &^c may be all played in Concert, whereas in y^e corded Instrument as in a Violin, y^e tone depends entirely

merely upon ye strings, but also upon ye Material & Ly
composing ye body of ye Instrument. Now, ye point
being settled, let us see how ye Sounds are formed in
our Larynx.

Mr. Ferrein alledges ye they depend upon
ye ligaments entirely, ye these are ye cords which
form ye sound, & he has certainly shown ye they con
tribute in a very high degree, because in Animals
when recently dead, after ye tips of ye Arytenoides
Cartilages are cut off, & ye ligaments alone left, ye
voice of ye Animal can in some measure be imitated
imitated by forcing out ye air, I shall show him
afterwards in Fowls, where ye voice is imitated
more readily. So he alledges ye ye cords alone
form ye voice, & ye ye aperture serves to increase
ye strength of it. Now, tho Ferrein treats of
this subject more clearly than ye former authors
yet some of his invention he carries matters too
far, & it will be found ye ye vibration of ye
other parts, & ye size of ye aperture likewise
contribute; as ye our larynx is not only a cord
but a wind Instrument. In proof of this I'll
observe to you ye ye neighbouring parts are
well calculated for vibrations, particularly ye

4.

y^e Cartilages of our Larynx, in general y^e Cartilages
of y^e Trachea, or let us observe what is done when
we form very grave or acute tones, let us apply y^e
fingers to y^e part, if y^e Dilatation depended upon
y^e ligaments of y^e Larynx, those alone would be
acted upon, but instead of this Tube y^e whole
throat for a time rises; & form an acute note not
contented w^th drawing up y^e Os hyoides, but y^e same
time make a full inspiration, pull down y^e Dia-
phragm as far as it can go, y^t y^e weight of y^e
air may stretch y^e lungs, & all y^e branches of
y^e trachea, which cannot be explained upon
y^e principles of Sound, or make y^e experi-
ment upon Beasts, in y^e kind of Animal y^e
ligaments of y^e Larynx, & those organs forming
y^e aperture into y^e Trachea, are placed at a
distance from each other y^e former one at y^e
top of y^e breast & y^e latter at y^e top of y^e Trachea
Now Shave out y^e Trachea in a living dog, &
not only y^e strength of y^e voice, but y^e tone was
altered by y^e incision, Ob. observe what hap-
pens in whistling, do not we perceive y^t not
only we give y^e Lips tension, but y^t we alter
y^e aperture, & in y^e last place do not we

perceive

perceive yt nature hav amplevly filled our muscles
for allowing yt tension, & also yt aperture. So I wd
conclude yt our voice possesses this advantage
over all other Instruments, yt it combines yt wind
& corded Instruments together; & next yt yt cords
instead of being acted upon by solid bodies, are
acted upon, in a more equable way, & which we
have yt full command, by yt air intermitted by
yt lungs.

We next proceed to examine yt muscles
which move yt head upon yt Trunk &c.

We do not find any two Anatomists
agreeing in yt description of many of these mus-
cles, which depends upon two circumstances
yt we cannot separate many of them into yt
portions described, without tearing several
Muscular fibres, & following yt muscle
into yt Vertebræ it becomes tendinous, yt
Tendon passes to another bone, & it is made
use of by nature as a ligament. Now some
describe yt insertion according to yt place
first closely connected, while others trace yt
fibres further. Upon yt whole Albinus
has given by much yt most accurate dis-

section.

union, but he has unluckily taken y. fancy of describing y. Bones in a different way from all other Anatomists, instead of beginning at y. base he chooses to reckon them y. reverse way from y. bottom upwards, & while he enumerates y. ten bones in this way he reckons y. ribs in y. common way, from above downwards, but this division & general descriptions are excellent, & we find but very little room for making Criticisms. He also demonstrates y. muscles of y. superior extremity connected w.t y. Trunk

Lecture 11th

Let us now attend to y. combined action of those Muscles.

We have seen a great number of y. Muscles w.ch are chiefly intended for y. motion of y. head, but few of them are upon y. fore part, because y. muscles of y. Jaws can alone act upon y. whole head, & y.t w.t great advantage & y.t in consequence of y. distance of y. Jaws from y. condyles of y. occiput, y. centre of motion, when we act only w.t y. muscles proper to y. head, y. different degrees of obliquity

obliquity of y^e Sterno Mastoideus Muscles, balan-
cing each other, y^e head is drawn forwards, &c.
w^t respect to y^e Muscles in time, & in general
you will observe y^t y^e obliquity of y^e motion of y^e head
is alwaies y^e same, whilst
shend y^e head forwards, sum y^e (face) head to y^e
side, & alternating y^e action, give a kind of
rotation to y^e head. In like manner on y^e
back part, either w^t y^e action of all y^e pos-
terior muscles, draw y^e head strongly back-
wards, or acting w^t y^e oblique muscles of
y^e opposite side, give it a rotation, Un-
take all y^e motions, which we are capable
of performing w^t y^e head, shend y^e head obli-
quel forwards by y^e anterior oblique muscles
& backwards by y^e posterior, but at y^e same
employ an anterior & a posterior muscle at
y^e same time, so if I want to press y^e ear
down upon y^e shoulder, employ y^e sterno
mastoideus & y^e splenius suspove of y^e same
side, y^e obliquity of y^e one balancing y^e
of y^e other, y^e head is moved in y^e diago-
nal between them, & by a succession of
these I can make my head describe a
circle

Circle. There is to be a remarkable relation upon
y^d both sides betwixt y^e Vertebræ, & we
can make this relation w^t ease, or w^t greater
number of muscles. For giving y^e head its full
swing, Tract w^t y^e sterno mastoideus, then w^t
y^e splenius of y^e opposite side, also y^e trachelo
mastoideus, & inferior oblique join in this action
& I can threw in to assist y^e musculus complexus
but Chiefly act w^t y^e other three, & reversing
y^e motion I give y^e head its full play.

The action of y^e muscles of y^e neck
& of y^e Trunk is more simple, because there is
no contrivance for a free relation, we only twist
y^e Vertebræ sometimes, & if we are at a loss to
use force w^t y^e muscles of y^e head, we bend
y^e head, & at y^e lower part, if we are at a
loss, we call in to our assistance y^e Abdomi-
nal muscles, especially in order to twist
y^e Body, when we want to twist y^e loins, we
do it by y^e external oblique, & y^e internal of
y^e other side having y^e same direction, we
use y^e two as one Digastric muscle; & y^e
number of muscles is gradually increased
as we go downwards, as y^e upper part of

y^e

yt. they in gaining a longer lever, & there is an addi- 513
tion made by yt. Bowels to yt. weight.

Now next let us attend to yt. motions of yt. Scapula. Authors before Winslow used to speak of yt. motions of yt. Scapula upwards, downwards, backwards, & forwards, Winslow has added to these, a rotation of yt. Scapula, & one of his circumduction he carries things too far, rejecting yt. direct motions. I say further he errs wt. respt. to yt. manner of yt. rotation he conceives it to roll on an imaginary Axis put thro' its middle but from its connexion to ye clavicle, it is impossible it should do this; we make yt. Scapula roll upon yt. one of yt. Clavicle, which is yt. real centre of its motion, next we roll yt. clavicle itself upon yt. top of y Sternum, But yt. we can perform yt. motions upwards, downwards backwards & forwards is so evident yt. we all experience it. & we can point out yt. muscles yt. are fitted to perform it. Viz. yt. Trapezius muscle joined to yt. lower Scapula is fitted for making yt. motion of yt. scapula upwards yt. obliquity of yt. one balancing yt. obliquity of yt. oyt., & preventing yt. rotation.

Next

Sept of whole trapezius muscle, being at once 54
known into action, (viz.) the base of the Scapula
towards the spine of the body, Secondly I mean
to make the motion of the Scapula downwards, the
lower share of the trapezius, & the Serratus Antic.
us major are specially fitted for our purpose
And to pull the Scapula directly forwards, Sclav.
ion of trapezius, & act. of Serratus Anticus
major, ballancing it by the serratus minor
& pectoral, And by a succession of these
motions, I can move the Scapula in a circle.
Sept I can roll it, when I raise the humerus
first to a right Angle, the motion of the arm
is performed by the rotation of the Scapula, the
muscles being very loose, yields easily, & we
perform this action by the same muscles as
the direct motions, but we know them into act.
ion in a different manner, as in order to
draw the Acromion upwards, I employ the mus.
culus trapezius, & at the same time the under
portion, especially of the Serratus Anticus
major &c.

We next attend to the principal actions
the we perform with the muscles of the humerus,

Thus

thus of these come from y^e trunke of y^e Body, hence we can either move y^e arme in generall upon y^e trunke, or y^e Trunke upon y^e arme, As I mean to draw down y^e arm very strongly, y^e Larger pectoral & y^e latissimus dorsi will cooperate in this action, so as to quarter any humble below y^e arme, kept if y^e arme is lifted up, & Make hold of a firm substance wth it, Drawn y^e body towards y^e arme, as if I Make hold of a beam, & want to throw my body up, Thus in this action these two muscles, actuis at y^e same time wth y^e muscles of y^e Trunke.

Let us next attend more particularly to y^e single actions, & to such combinations of them, as it may be useful to know, beginning wth y^e pectoral muscle. The effect of this is, if y^e arm be by y^e side, it throws it across y^e Breast, but if it is already across, then it draws it down, & as y^e same time I command, I shall next take y^e muscle connected to y^e pectoral, y^e Deltoid, & we shall find y^e action of it to be very curious, I can raise my arm wth y^e force of y^e Deltoid alone, acting in a certain manner wth it, but by acting in

in another way wᵗ: it; I can prove yᵗ: arm does
yᵗ: side, that w: this muscle may be brought
to Antagonize itself, or one part to be yᵗ: Antag-
nistᵗ of another, I have formerly taken some
pains to show, yᵗ: we are not under a necessity
of throwing all yᵗ: fibres of a muscle into ac-
tion at yᵗ: same time, Now if yᵗ: Deltoid is
brought into action at yᵗ: fore & back edges w:
press under yᵗ: ball of yᵗ: humerus, yᵗ: arm is
drawn directly into yᵉ: side, (But commonly
it chiefly as a Leader of yᵗ: humerus, Major
yᵗ: action wᵗ: yᵗ: middle of yᵗ: Deltoid, & by degrees
as all the fibres are drawn on yᵗ: outside of y
ball they all come to assist in supporting y:
Arm, but we never almost act wᵗ: all yᵗ:
fibres at yᵗ: beginning of this action, Now
yᵗ: use of that will readily occur to you, as
my arm rises from yᵗ: side, suspending a
weight, yᵗ: weight is continually gaining
lever, so it is necessary yᵗ: yᵗ: muscle also
be gaining strength, or at last Turning into
play yᵗ: whole muscle, I assist this com-
mon action of yᵗ: Deltoid by yᵗ: supra spinatus
lus, & likewise by yᵗ: Coraco brachialis

C

Scan ad ye plenum y. infra spinatus, or, after
y Arm a nerve scapul it in y. situation
by adding y. Coraco-brachialis, & y. infra spi-
natus, Nopl y. teneo muscles prevent, wch
evidently serve for drawing y. arm backwards
but so y. tendon of those muscles in Pipes
by y. capsular ligament, & extension obliqu
by to y. tubercle. they give it a degree of rotation
the teres major gives it a rotation; & in like it
is assisted by y. latissimus Dorsi, & acting wth
y. teres major & latissimus Dorsi by the muscl
ves. The psalm of y. hand is turned backw-
wards, ready to grasp & substance be-
which is y. most convenient situation; &
it is done by y. obliquity & turn of y. tendon
round y. bone, The last muscle of y. hu-
merus, y. subscapularis, can draw y. arm
inwards to a certain degree, y other muscles
act at y. same time, or is I mean to give
a stroke wth y. elbow, backwards, Simply
a great number of muscles at y. same time
viz. y. latissimus Dorsi, teres major, sub-
scapularis, y. infra spinatus, & Coraco
brachialis into ather y. back edge of y. deltoi
muscle

muscle, & y. long head of y. triceps, y. humerus, y. obliquity of these muscles counterbalancing one another, & y. injur. y. muscles prevents them from making y. motion, have y. arm is bowed backwards. But if y. arm is strike w.th a hammer w.th y. fore arm, y. motion is performed by y. subscapularis, assisted w.th y. deltoideus & teres major, & y. back is struck by y. teres minor, & y. infra spinatus.

The motions of y. fore arm are much more limited, y. motion of y. fore arm by means of y. triceps, semi w.th y. anconeus, if y. muscles inserted into y. olecranon, & y. rad. w.th y. long head of y. biceps, then it being back y. humerus, or a part of y. muscles of y. scapula in making y. stroke before described, & by these muscles a greater force in supination y. action, & by these y. joint at y. elbow from being hurt, we find y. use of y. fore arm. But w.th y. muscles of y. fore arm, can act occasionally upon y. wrist joint, thus fixing y. fore arm, & prevent it from pronation, & acting w.th y. biceps, & more y.

y. whole body. The internal brachiæus counter acts y. triceps, but is more limited in its action because of its shortness, but y. triceps moves & can give a very large play to y. several parts, & so this muscle has a common effect when we pull it in a straight line, it turns y. palm of y. hand upperm. & in order to convey any thing to y. organs of y. senses, the next action is y. flexion, but if that is resisted by y. distal edge of y. triceps, it is more a flexor of y. humerus, or bends y. whole arm. If ye fix y. arm any how & can make it act upon y. scapula, & can make y. scapula move upon y. edge of y. humerus. We are told of a person in y. Memoirs of y. French Academy, who performed all this by means of this muscle, he placed a gun between his scapulæ, & could fire it as he could raise his Body from y. ground upon it. Now, to do this he put together y. palms of his hands behind his back, so y. Biceps is full stretch, & as y. brevis muscles, he raised y. scapulæ upon y. ends of y. humeri. But if I consider

near

very much wt ye supinator muscle.

Next shew you ye situation of ye humerus when lupated, the head of ye bone is generally, if not always turned forwards & downwards behind ye pectoral muscle, we discover it in ye following manner, first ye lupated arm is shorter than ye other pasing by ye vertebral a little, Nept ye elbow is turned outwards, & ye patient findeth difficulty to bring ye elbow inwards, & he also generally findes a difficulty in raising ye arm to ye head, & in every case of this kind, putting our hand upon ye acromion we will be sensible of a hollowness under it & passing ye hand to ye edge of ye pectoral muscle, we feel ye ball roll, so there is no difficulty in distinguishing this lupation. Such Authors as have wrote on this subject have missed discerning ye principal difficulty yt attends ye reduction, namely ye tendons of ye Biceps muscle, which fall between ye head of ye bone, & ye glenoid cavity, & are put upon ye stretch. If therefore surgeons as is commonly done, stretch ye bone

arm

can be removed if your force may be more wt. ye
end effect, whereas if you will diverse to bend ye
fore arm, & to use ye wt. of ye hand ye biceps muse
cle, you may remove it wt ease.

Volume 4th

We proceed to examine ye ligaments & muscles of
ye fore arm &c

The vinate action of these muscles
so sufficiently understood from their names, let
us next allow to ye co-pronation. At ye wrist
from ye shape of ye bones we have a large pro-
pronation but from ye length of ye radius, ye
lateral motions are more confined, & we have
here scarcely any notation. We turn ye wrist
to avoide by ye flexor radialis, ye flexor ulna-
rius, & ye palmaris longus muscle when it
is found, or if I mean to bend my wrist
fully I employ those three muscles above
mine, they and ye three flexors of ye wrist
& by means of them I bring it straight
forwards, In like manner in order to com-
pound these, I employ ye extensores radia-
les, wt ye extensor ulnaris, if I mean to

(draw

draw y^e^ wrist vide ways, Tact al y^e^ same time y^e^
with a force & a back movele, & by a succession
of these motions. Draw a Circle laterally wise
upon a wall.

For y^e^ fingers we find two sleeves,
but one sleeveless, because it is of much more
use to bend than to extend y^e^ fingers wch for as
but as we have but one sleeveless nature guards
against accidents by joining y^e^ tendons of it
together upon y^e^ back of y^e^ hand, y^t^ if by any
misfortune one of them comes to be divided
y^e^ lateral connexions may continue y^e^ mo-
tion of y^e^ finger, in which y^e^ cut tendon
immediately terminated in some degree, tho
in a less perfect manner. When we find y^e^
tendon of y^e^ sleeveless spread out broad upon
y^e^ back of y^e^ hand, whereby it is less expe-
sed to injury, & it in some measure vences
y^e^ office of ligaments, giving strength by y^e^
knits, & y^t^ wch out preventing their ready
motion, because y^e^ tendon open to allow
y^e^ middle swelling part of y^e^ bone to
play wch out resistance. The tendon at
last reaches y^e^ last bone, receiving
wch

with ye extremes. I feel mem yt not ye sinews
grow, before it comes to influence ye pulse, wch
there is any slippery substance in ye hand, I
cautiun it examine it. & yet wt. ye danger
of ye evacuation: for tho' I open my hand a little
my fingers still remain reclined over it.
At ye wrist when ye chief flexion is made
ye tendons is tied down, yt. it might not open
wt. too much effect. Sept ye several tendons
being collected from a large circle into a
smaller, on opening ye hand conclosing ye
fingers are spread out, & ye breadth of ye
hand gradually increased, & this is partly
owing to ye situation of the tendons fingers
which are placed upon ye circumference of
a circle, & partly owing to ye situation of the
tendons. The flexor tendons are tied down
still more carefully; because they pass
over a greater number of joints, which
form Angles, as ye transverse ligament
& ye Hypothenar partmaris serve this
purpose, & then we find a sheath into
which ye tendon is received. Sept we
observe yt. these tendons are in a great
measure

muscles, in order to accomplish these objects
& are first of all considered separately, & other,
& profundus terminating in the last two phalanges
& sublimis terminates in the second, so acts
especially upon the third bone of your fingers
& first & second bones of all the fingers,
but the greater number two articulations
only. Now originating from first pair in muscle
to pisiform on the second, or without any
regard to the inoculation between these
three steps moves first the two last pieces.
Now, the advantage of the literosi circuit
that we may reach the fingers beneath annular
ligament.

The Lumbricales & Interossei muscles serve in a great measure for these
motions. Many also consider the Lumbricales
as a third stepon, but they take their
from the strength of the stepons as they add
to them, for they are united in the stepons
but after by the tendons, we have to
the fingers as far as they can go, & the con-
traction of the muscle is not sufficient
by the Lumbricales increased the extent

y. action. That y. Tuberosity of y. ulna may be employed to bend y. fingers further, & w. y. less force, they are a third deeper. As for y. motions of y. Thumb & little finger, these are sufficiently understood. it is evident y. y. Thumb is bended as an Antagonist to y. rest of y. hand, & y. only things remaining is y. pronation & supination; in both these micrescovenled. Winslow comes near to y. true idea, but he rather allows too much motion to y. ulna, & we seem to observe a large motion of it; but when we have y. aim to prevent y. rolling of y. humerus, & hold y. Olecranon fast, we discover y. y. motion is in a line drawn from y. head of y. radius to y. bottom of y. ulna, & y. y. radius w. y. hand go round y. ulna, so y. y. motion of y. ulna is so inconsiderable y. it may be overlooked. For y. notation we employ y. pronator radii teres, & y. pronator quadratus, & we replace y. fore arm by y. two supinators, particularly y. brevis w. is better calculated for y. rotatory motion, but if we are to use very great force, we

can

can afford by ye muscles of ye wrist & fingers
so if we are to make ye supination of ye hand
w^t force ye Biceps must, so a supinator
Scanalbo afford by raising w^t ye longe muscles
ye colonè ye thumb, so whatever makes ye
neck of ye thumb approach to ye internal Con-
dyle serves for ye pronation, & whatever makes
it approach to ye external Condyle serves for
ye supination, do ye fingers are from ye in-
ternal Condyle, & ye extensors from ye exter-
nal Condyle of ye humerus, so in this way
in ye most easy situation of ye arm ye
violence in ye least, & ye muscles are better
prepared for a full flexion & extension w^t
out passing much over ye bones in an oblique
manner, you will observe ye effect of lying
down ye londone in sheaths, yt ye flexion &
ye fingers is thereby very considerably in-
creased by a very small contraction of ye
muscle.

Lecture 8th

We next proceed to demonstrate ye muscles
of ye lower extremities, & bid us attend to
ye

ye very general effect of ye few of these muscles

We can move our thigh backwards, forwards, inwards, outwards & by a succession of these motions we describe on ye wall a circle with ye foot, we likewise perceive ye power of rolling it; & we can perceive ye power whether ye thigh be in a line wt ye trunk of ye body or ye we bend it (...)

To bend ye thigh, we use ye Psoas Magnus Iliacus internus, which are like one Digastric muscle ending in ye trochanter, these muscles do somewhat more, they resemble in their insertion ye Biceps of ye arm, they are twisted round ye bone, & of ye two are turned inwards, their direct effect is to give a degree of rotation to ye thigh. These two muscles are chiefly assisted by ye Gluteus magnus, which is ye principal extensor of ye thigh. If it mean to draw ye thigh strongly inwards, as when we sit on horseback, & press in upon ye saddle wt ye knees we employ all ye muscles adductores, & counteract these by ye two small Glutei, which are ye abductores seu semorio. It remains to explain ye

rotation

solution of the thigh. If the thigh is in the same
with the body, & I mean to roll it, I employ all the
small muscles of the quadratus, pyriformis, gemi-
ni, & two obturatores. Psoas iliacus & ilium
(psoas, & iliacus internus) acting with small
portions of the lesser glutei, & with the muscular
fascialis. Inspiration of the bone, but a curious cir-
cumstance takes place when we roll the thigh
in the bended posture, the Angles of the muscles
are quite changed, the rotatores become the ab-
ductores, & the abductores the rotatores.

Now after explaining the action of the
muscles of the thigh, you will keep in mind a
circumstance, that they only act in this way;
when the weight is thrown off the leg, but if they
act with the same muscles with the weight thrown
down upon them, the leg is more fixed than
the trunk of the body, so they all become mus-
cles of the trunk, & they now roll the position
of the thigh bone, with regard to the
Psoas magnus, which in this case draws
the body forwards.

We next attend to the motion of the
knee, which is chiefly a hinge, & almost
entirely

entirely so when y. leg is nearly in y. streight line of y. thigh, but if you shorten y. leg, & bring it to a right angle wt y. thigh, there is a considerable rotation. The extension of y. leg is performed by 11 great muscles, y. Psoas, y. Iliacus, & y. Crureus acting all at y. same time, shortening y. leg are y. Biceps flexor, y. Semitendinosus & y. Semimembranosus. From y. Insertion you must judge y. Straight employ of Sartorius & y. gracilis, but pulling them when y. leg is streight, they draw it down upon y. thigh, without contributing much to y. flexion but after I have begun to make y. flexion wt. y. other muscles, I throw y. Sartorius & gracilis far beyond y. joint, & then I tye them as before, & from y. next length of y. fibres, their action is very extensive. So y. name of Sartorius is by no means improper, for in drawing in y. leg as Taylors do y. muscle evidently assists. Here see y. intention of nature in throwing more muscles into action, as y. leg leads, & they also gain y. advantage of angles in proportion to y. raising of y. leg. Now attention

is nec.

bening ye most common & omisse action of ye stepon & extension, we next bend ye leg & action ye ligaments, particularly there at ye side of ye joint, then we make ye relation, ye stepon and extension serue to all ye leg, & we add ye flexion two postilions. Last if I throw my weight upon ye leg, there muscles become muscles of ye pastern alone, instead of lifting ye leg they extend & bend ye thigh upon it. so if I am to raise my self, I do not keep ye foot out, but draw them back, bring them beneath me, then I put out ly & firmly in raising ye thigh upon ye leg, further ye extension of ye leg, excepting ye rectus come from ye thigh, whereas ye muscles of ye leg be bind are from ye hunch bone, frequently used them as muscles of ye whole hunch, as in bending forwards, to make ye pelvis roll upon ye top of ye thigh bone.

I shall next show you ye ligation of ye thigh bone you observe ye ligament of ye head of ye thigh bone does not merely inclose ye ball, but comes down upon ye neck, so we can open nile it down that ye ball would bring in danger coming in,

in upon y. head of ye Thigh bone, & when it is
but further that this Capsular ligament is ge-
nerally torn in Lupations, The most common
kind of Lupation is, where y.e head of y.d. ball
goes inwards, & downwards at y.e foramen thy-
roideum, & we distinguish it in y.e following
manner, as y.e foramen thyroideum is not
sufficient to let y.e head of y.e thigh bone pass
thro' it, & is lower down than y.e acetabulum,
when y.e Lupation happens here, y.e limb is
lengthened, & kept as y.e bones stand so yet
y.e toes are turned a little outwards, now can
we, taking hold of y.e foot, make it rest exact-
ly. Next, If I put my hand down from y.e
anterior spinal process of y.e Ilium, I find a
hollow at y.e acetabulum, & I find y.e
head of y.e bone projecting further in. Some-
It has sometimes happened y.t y.e bone has
slipped upon y.e pubis, & resembled very
much a large tube, but y.e ball was found
to rest in y.e socket.

Now, <u>how are we to reduce it?</u> It
appears y.t this has been always mis-
managed, them not attending to y.e prin-
cipal

cipal resistance. The difficulty of reducing the humerus is very much owing to the tendon of the biceps, we have the difficulty chiefly depends upon the tendons of the triceps extensor cubiti & power muscles pulling out the head of the bone as soon as it slips out of its socket. So, instead of pressing the weight, we ought to bend the thigh. This is the best passage towards the reduction. When we turn the foot outwards & inwards, because of the oblique passage of those two muscles into the trochanters of the thigh bone. Then we draw the leg of the thigh out, & press it inwards, & we will scarcely need to make any extension. But cases will occur where after bending the thigh, the next thing will be to draw away the thigh from the pelvis.

Next we rotate it outwards, when the head of the bone is covered by the triceps internus, & where the accident has not been attended to, these muscles have come to cover as a pocket for the thigh bone. The limb in this luxation becomes shortened from the other, & the toes generally are turned inwards. There is also a resistance

from

tell in making y. motion we feel a hollow at y. Accelabulum, & find y. ball under y. glutæi. Now in this Luxation as in y. former, we ought to bend y. thigh, because y. Glutæi minores are then chiefly on y. stretch, & by doing so, from Abductores, they become rotatores, & to shorten these muscles still more, we turn y. foot outwards, then making an extension to reinvert y. thigh, we draw y. knee outwards, & turn y. upper end into y. socket.

Volume 4th.

The Muscles of y. foot, w.th y. ligaments & y. in serient & tendinies demonstrated.

Before I proceed to make any remarks upon what has been demonstrated, I must put you in mind of what was shewn in y. Osteology, That there are chiefly two processes more especially at y. ends of all y. long bones of y. extremities, because y. knowledge of these is much connected w.th y. articulations, serves to explain y. security each have, & y. manner w.th which y. muscles have form their motions. Besides y. knowledge of these is

in

in of neal use in practice, it prevents mistakes, &
enables us to explain several appearances, that
without ye knowledge of these epiphyses; a fellow fall
we may suppose a disjoint or fracture, when there is
only ye natural division between ye two bones, or
it may be real off. & former of ye leading marks
in fractures, ye crepitation, here is not always
ye nature of ye accident, & does not justify ye proper
bandages, or ye surgeon may mistake il
for a luxation, & after replacing ye bones may
not give a sufficient security by bandages, &
we may explain a number of appearances in
weakly children, as where ye epiphyses is re-
laxed by disease, or yield to ye weight of ye
body. —

Sept we attend to ye shape of these mighty
ons in forming ye articulations, or we endeavour
to reduce ye articulations into Classes, &c no
branch of Anatomy has been treated w^t more
perspicuity than this. 1^st We have seen in
many places ye bones joined by their edges
2^d. In many other places, there is a close con-
nexion by cartilages, wherever there is
much danger from a separation, & chiefly

4.

yᵉ bones in many places are tipped wᵗ Cartilage
& tied by ligament, &c. I have I supposd yᵉ principle ligament
which obtains in yᵉ Quadruped, are destined & is
tied to yᵉ Clavicle & yᵉ organ is tied to yᵉ humerus
of yᵉ Body; & when yᵉ Os hyoides have no ligament
but depend from yᵉ head. —

You will next attend to yᵉ motions
we perform & to yᵉ appearance of yᵉ joints. In
many places yᵉ bone is formed into a round
ball, & we find a ball & socket, & a recumbent
in all directions. In other places yᵉ surface
of yᵉ bone is almost flat, & yᵉ motion greatly
limited. But in yᵉ greater number, there is
a motion like yᵉ Clavicle & this may be of
three kinds, in one part yᵉ motion is one
pin, but in most parts yᵉ motion is in two
directions, & lastly we find a contrivance
as in yᵉ Vertebræ, where yᵉ same bones are
tied to one another in two different places
& where one motion is performed by both.
Now every one of yᵉ joints may be reduced
under yᵉ heads I have mentioned, & there
is no necessity of going lower as I have shewn
& from yᵉ Greeks, who did not understand

yᵉ

Sept let us attend to yᵉ structure of yᵉ joints. We perceive yᵗ every joint within a joint is covered wᵗ membrane, there is an internal layer of every capsular ligament reflected to invest the bones included in yᵉ joint; in other portions of them, as in the bones for containing yᵉ patella or which layer yᵉ glands of yᵉ joint. We find on yᵉ outer side of this internal layer, fibres disposed in very different directions, for which we can only account by attending to yᵉ extent & kind of motion, & when necessary, we find yᵉ proper ligamentous fibres covered by yᵉ tendons continued from yᵉ muscles, & without any exception, we may trace yᵉ periosteum from one bone to another, joining within to yᵉ proper ligamentous layer, & without to yᵉ tendinous, so yᵉ periosteum may be considered as one sheath inclosing all yᵉ bones & all yᵉ joints.

Sept we observe yᵗ a liquor of a certain kind, is necessary for lubricating yᵉ joints, & which does not agree in its properties wᵗ any other, not coagulating

when

Man in a healthy state, wt. acuon, or wt. heat, & ll
which more resembles ye. Saliva than ye. Chyle:
The Ungues perform all this by ligaments & expose
to agitation, but are defended from being hurt
in our common motions, &c., in different joints
in very different ways. Thus let us take ye.
great joints of ye. inferior extremity, in ye. hip
ye. thigh ye. ligament is drawn out by ye. round
cord, & ye. glando again succeed in by ye. head of
ye. bone, in ye. knee ye. gland is connected wt.
ye. very moveable patella, which never makes
a flexion or extension without affecting it, at ye.
Ancle it is wanted by being placed between ye.
two firm bones. However by a sudden motion
these glandes may be injured, & painful &
grievous symptoms may be produced.

So my Father mentioned a case where
ye. gland in ye. socket of ye. thigh bone had been
heal in, he suspected ye. synovia, but could not
distinguish a fluctuation, & after ye. death of
ye. patient, he found a spoonful of two, of pale
matter within ye. cortical, & ye. gland was
quite destroyed.

Dept. when I showed ye. tigamente

you

you discover y. extent of y. suppuration, & y. thickness of
y. where operations are necessary, you may be
enabled to y. proper places for making incis-
ions. Tam afterwards to consider y. dangers
of such operations, Tenby here take for granted
y. necessity of y. operation, y. y. place may
be found out, for if we are to open y. joint of
y. Ancle, we would not go in at y. side, but
would penetrate where y. ligament is thin-
nest, as at y. fore side. As to regard to y.
knee, we would cut into it at y. inner side
where y. tendinous aponeurosis is thinnest.

Next we attend to a few general
circumstances wt respect to y. muscles,
We find in consequence of y. entanglement
of y. fibula, & y. y. muscles are tied to y.
extremities of y. bones, y. most of them con-
siderable influence. So
we find Bursæ mucosæ interposed to lessen
y. friction, wherever a tendon is subject
to friction, we almost certainly find such
a Bursa, & they are more numerous than
at present known, sometimes
a tendon, near to y. joint of y. wrist

x,

or Ulnar passes thro a sheath, there is w.th y. [illegible]
sheath a bursa mucosa, not only to y. sheath
smooth, but there is a bursa w.th all its appurtenances to be found, & w.t out any communication
w.t y. neighbouring parts. In Rheumatism
I have seen these bursæ distended w.th liquor
& producing tumours. W.th respect to y. degree
of danger, which may attend forming y. bursæ
I imagine it will be nearly y. same as y.t w.ch
attends y. incision made into ligaments, for
there is a great agreement in y. structure, we
find a similar membrane, & in one as from
an at y. heel, one finds extension for y. secretion
of a similar liquor, as you should have this
circumstance in your view.

Next we would attend to y. accident, to which our muscles, & our tendons
may be subject. We all know y.t they are
sometimes lacerated, as well as cut, by common
accidents, but generally a wound in them is
entertained about y. cause of y. laceration, w.ch
frequently surgeons from ignorance such
accidents properly & sufficiently. In where
y. Tendo Achillis is broke, or y. tendon

Next

about ye. head lore, generally it is supposed yt.
ye. laceration is caused by ye. weight of ye. body
bending ye. joint suddenly, & yt. may contribute
but you are to conceive ye. laceration as chiefly
depending upon ye. effort which ye. muscle itself
makes, or ye. belly of ye. muscle may be as subject
to laceration as its tendon, one joint
of fingers may act wt. too great violence, & tear
itself by ye. suddenness of its action, & without
attending to this, ye. Surgeon expecting only
to find it in ye. tendon, may overlook ye. lace-
ration in ye. belly of ye. muscle. Wounds as
in such cases ye. cure is made by keeping
ye. ends joined together, so it is of ye. greatest con-
sequence, yt. we should understand ye. cause
& ye. direction of ye. muscle, & ye. manner of
bending ye. joint, so as to relate it to ye. ill
most.

Next whenever a tendon makes a turn
it is tied down by a sheath, & here ye. difficulty
is greater, for by bending ye. body in one
posture, ye. tendon may grow to ye. sheath,
so yt. a degree of motion will be necessary
which will require ye. judgement of ye. Surgeon,

In

In like manner y^e sheath may be torn, & nearly y^e same caution will be necessary, so my Father used to mention a case of this kind in y^e late Duke of Argyle, who by a sudden effort had y^e sheath lying down y^e hinder part of y^e Penis inwardly torn, so y^t y^e London: started out between y^e fibula, & whenever y^e Muscles got a wrong direction they were thrown into a Cramp. Now if such a torn be properly taken care of a new sheath may form, or when it is neglected we endeavour by an artificial compression to confine y^e London: to its place.

Next we observe what may be particular to any of y^e joints. I think it unnecessary to repeat y^e observation I made concerning y^e pelvis, we find y^e Cavity for y^e Thigh bone remarkably thick, & strong above y^t y^e bottom where y^e extremity of y^e joint is lodged, is transparent, so if it is injured & matter is formed in y^e cavity it may make its way into y^e pelvis before it can corrode y^e ligament. In such a case therefore if y^e (disease can be) discovered by any certain mark, we could open y^e ligament near

y^e

ye hollow of ye knee, answering ye large vessels & nerves which pass over ye ball.

Toward ye luxation of this joint but you will have in your view ye fracture of ye knee as when it happens ye limb is shorter as when ye thigh is luxated out of ye socket of ye ilium, but we (dividing each from ye bone remaining in ye socket, & making a relation, we do not find ye ball nothing under ye usual muscles, & hardly we judge from ye nature of ye accident, & ye crackling of ye parts after we have drawn ye limb to its proper length, it immediately goes back in ye fracture, w.th out proper and being taken to your it ..

At ye joint of ye knee, we find always two, often 3 distinct cavities, viz. a Bursa mucosa above, & another beneath ye patella & beneath these a family of ye joint, Now, tho there is a resemblance between these cavities ye opening of ye Bursa mucosa is probably not so dangerous, & where matter is collected here, we may find out ye difference by examining ye pus que se at ye tumour i

&

& if it is above or below it will be small, & yt. patella will not be moved forwards, but if it is in yt. joint, upon making a flexion, we feel yt. patella in motion, & moved on yt. Condyle. Yet we find a great strength of ligament round this joint, so yt. we would scarce suppose a Luxation here curable; but in fact I have met w.t several cases, where yt. whole knee was dislocated & which were perfectly cured.

There is another kind of Luxation in bending, which I have seen some very bad Surgeons mistaken, yt. of yt. patella. I saw one of this kind a Man about 25 years of age, & remarkably tall, as he was endeavouring to throw a shuttlecock, he slipped his foot & was sensible of some part of yt. knee going out of its place, & was unable to make any motion. The Surgeons found yt. bone in yt. very posture, in which it remained 8 days, before I saw him. The inner side of yt. patella lay against yt. outer side of yt. femur, & we saw yt. shape of yt. patella thro' yt. skin distinctly, I concluded w.t yt. late

yt.

y. y. surgeon has not taken care to prevent
y bone by drawing it forwards, tho' they have
used considerable violence, & even endeavoured
by a stroke to beat it into its place; Accordingly
Mr. Adie not to mistake, & placed himself on the
groin always &c, upon y. inner side, then forcing
hold of y. patella, to push it all his strength but
he found y. it was to no purpose; Upon considering
y. cause of this, it occurred to me y. it was im-
possible to push in y. finger, so much as to
raise y. inner side of y. bone, so placing my
self on y. other side, & pushing it back with all
my strength, in an instant y. bone turned
round, & went into its place —

Let under this articulation we have
seen a number of muscles inserted, which
are said to affect y. leg, but tho' this is their
natural use, when we are about to amputate
y. leg, we are carefully to prevent them, for,
y. joint growing stiff, they become muscles
of y. thigh.

In y. Ancle we have seen y. motion
confined to two directions, to flexion & extension
as y. ligaments are weakest before & behind

Hip &c

When therefore a Luxation happens here, ye leg either
starts forwards upon ye foot, or ye heel forwards
upon ye leg, & by comparing ye two feet together, u
readily distinguish this; ye Luxation to be made
to reduce wt care, & ye motion of ye joint tobe
duly well restored.

The voluntary motion of ye foot is per-
formed upon ye end of ye Astragulus & it is ma
terial to attend to this in dislocations of ye ft.
for if ye Surgeon suppposes ye ligature is upon
ye joint of ye Ancle, he will think it necessary
ye ye Bandage should grasp ye leg, whereas
ye application may be confined to ye joint only.

With regard to ye dynamic Bones wt
you see particularly in ye foot, you may consi-
der ye patella as one of ye tarsal of them;
we need only to determine ye use of it; to wt
extend ye use of all ye rest. 1st It is a pro-
tection to ye joint, yt a cut does not so readi-
ly enter it. 2dly It serves for ye insertion
of tendons, as in ye foot & hand. for allowing
tendons to pass over them, yt ye tendon
may be thrown at a greater distance from
ye centre of ye joint, & its termination entire

ye

y. tibia at a y. neale Angle, wch y. force of y.
muscle is increased. 6

As I observed y. cure tendons are before
merely by y. effort of y. muscles, y. patella
may be here in like manner, as I shall in a
bone, where a person has y. patella weakened
by slipping y. foot in out striking y. knee
upon y. ground, y. bone in y. flexion, wants
a solid support, mapped upon y. end of y. thigh
bone. 7

After these remarks upon y. peculiar
parts of, y. only thing remaining is to men
tion y. combination of y. muscles in walking
or, let us consider y. manner in which ex
ercise is made, which is a very operose affair
even taking out y. culbrio of it.

I place myself in two feet
& I shall suppose y. I mean to make a step
in. my left foot, commencing falling between
y. feet, before I lift one, I must throw y.
whole weight upon y. other, therefore y.
very first thing I do is to throw, into action
y. muscles of y. side, in. y. abductors of
y. thigh, in order to throw y. weight over

&

to roll ye pelvis upon ye top of ye thigh bone.
I now stand perpendicular, & turn upon my right
leg, then acting w.th ye flexors of ye thigh of my
left leg, & at ye same time w.th ye flexors of ye
leg itself, in order to bend ye thigh, & ye leg likewise a little, in order to lift it. But now I
am obliged upon one leg, & ye other in standing
from my chair, before I can bring ye left leg
to ye ground, after lifting it, I must necessarily
allow ye pelvis of ye right leg to give a little, as
fact w.th ye extensor muscles of ye knee, yet they
are elongated, as I allow ye knee to bend, & not
stay to bring ye weight of ye body forward. I
begin w.th ye flexors of ye thigh, which action
ye right side, I now ye trunk forwards, not
I mean to pull it further, & now employ ye ex-
tensors of ye leg, for ye leg being fixed, they
raise ye thigh upon it, & bring it forwards.
In order to push it still further forwards
fact w.th ye gastrocnemii muscles, at ye same
time y.t I keep in action ye extensors of ye
leg, & as ye gemelli muscles cannot go inwards
because of ye action of ye extensors, ye heel
is raised, & my weight thrown further for-

wards

wards on y^e earth of y^e foot, till by degrees I draw
y^e weight between y^e two legs, & gradually bring
y^e whole weight upon y^e left foot, to make a
second step, when I repeat y^e same action, but
w^t a quicker swing of y^e leg.

In order to run, I only differ in this, y^t
by an instinct of nature, I do not bend so y^e knee
now much, but keep y^e feet more rounder, so
y^t y^e body is more leaned in running.

In order to Jump, I set w^t both legs
at y^e same time, & to fit y^e muscles for their action
to stretch them, I allow y^e joints to bend, & throw-
ing y^e power into y^e muscles at once, I spring strong
ly against y^e earth, & as y^e reaction is equal
to y^e action I repel from the earth
w^t considerable force; y^e same as if I had been
standing upon y^e back of another person, &
he had made y^e effort, or it is y^e same whether
y^e earth reacts, or we do it w^t our own body.

Lecture IV

We have now after seeing y^e structure & y^e busi-
ness of y^e Body, examined fully y^e situation y^e con-
nexion, y^e general structure & properties of

y^e

y^e several Organs, as far as could be readily discovered by dissection. We are now to enter upon y^e examination of them w^ch much more accuracy, & to view them in a more extensive, & therefore in a more entertaining light viz. As several parts consisting to form one machine or System, the connexion between y^e several organs has hitherto been concealed from us, because we purposely avoided to know y^e nerves, or y^e Nervous System, not merely y^t this w^d at once have led us into too wide a field, but because we were by no means sufficiently prepared for such an enquiry. For w^t out knowing y^e bones, y^e muscles &c, we wanted an outline by which we could describe y^e situation of y^e vessels & nerves, just as when a person describes y^e course of a river, he must first be acquainted w^th y^e lying of y^e ground thro which it passes. Next we avoided entering w^th accuracy upon y^e structure & function of each organ, because these in a great measure depend upon y^e blood vessels & nerves, or y^t mainly to be observed in y^e several organs is in a great measure owing to y^e modification of y^e one or two Systems, & of y^e nerves, thro not only

finely

truly so. Since before y. functions can be fully disclosed, we are under a necessity not only of pursuing y. larger branches of y. blood vessels & nerves, but till we trace them to their termination, & till y. functions are understood, we cannot attempt to explain y. changes y. are produced by disease.

If you look into y. most common Systems in your hands, as y. Mr. of Midwifery, you will find his System to be this. First, after y. heart is supposed to be known, y. arteries are treated in a particular section, yt. is followed by an account of y. Nervous System, & had Winslow been acquainted w. y. Sympathetic System, y. must have followed in the same order; & lastly y. nerves are described. And this method has been often followed by Anatomists, & appears at first sight eligible & new to students, But reflecting a little, we shall find abundant reasons for following a very different method. For before we have studied one System, y. particular parts w. which we begin are in a great measure forgot, & y. situation of y. veins w. respect to

to

to y^e Arteries cannot be fully understood, I apprehend y^t
therefore y^e our men y^e structure of any particu-
lar member will be more individual: if after we shou
y^e Arteries, we immediately shew y^e veins corre-
sponding w^t them, as also y^e lymphatics & y^e nerv
& there is a wonderful resemblance not only in
y^e distribution of y^e arteries circulating veins
but in y^e absorbent vessels, & y^e nerves: for
if we enumerate y^e principal branches of any
artery, we are led at y^e same time to enumerate
y^e corresponding veins, lymphatics & nerves
taking them thus together, we not only render
y^e study much shorter by avoiding much repe-
tition, but we observe y^e relative situation
of those systems which is of infinite service
Besides if we follow y^e several vessels & y^e
nerves separately, whenever we to attempt
to explain y^e intimate structure of any part
suppose of y^e liver, if I begin w^t y^e arteries
then take y^e preparations of y^t organ, you
cannot understand them, if again I delay
these till y^e nerves have been demonstrated
you have forgot in a great measure y^e distri-
bution of y^e vessels, I am therefore to

say

lay before you ye most material circumstances relating to
the structure of any material part of them, & thus I can go without deviating from my
theme by pursuing ye following plan.

Before we engage in ye prosecution of
any one of ye four Systems, we shall study ye
general purposes aimed by each; then we begin
wt ye description of ye particular branches, fol-
lowing ye course, tracing thus upwards from
kind yt ye first branches lead directly to
ye head, run to ye brain & cerebellum, or to
ye origin of ye nerves, some are lost between
ye nerves & ye vessels in ye same order we
would have taken, supposing we had pursu-
ed either System separately, for ye next vessel
els in a separate enquiry would be those on
ye side of ye head, & if we had been to trace
ye nerves alone, we would have taken ye
nerves of ye head, ye oesophagus, ye aspera
And having thus traced ye vessels & nerves
of all ye softer parts of ye body, we ended our
enquiries wt ye structure of ye bones, of
ye bones in general, & ye parts connected
wt them, & of ye cells, an particular

part

part of y^e Brain.

I now proceed to y^e execution of y^e plan mentioned, & beginning w^t y^e heart as y^e principal mover, I propose at this meeting, to demonstrate the circumstances w^ch regard to y^e organ, then to demonstrate y^e general structure of y^e Coats of y^e Vascular System, y^e Circumstances of y^e shape of y^e arteries, their dividing into branches &c. & lastly shall observe nearly y^e same things w^ch respect to y^e Veins, then I shall shew y^e appearances produced in y^e circulating System by diseases.

We consider'd y^e structure of y^e heart formerly as a Muscular organ covered by membranes, & pushing y^e blood thro' it into respective cavities &c. y^e view of y^e cavities of y^e heart & also w^t map, where you observe y^e real capacity of y^e Ventricles, & y^t y^e left does nearly (except somewhat lower than y^e right, but not much). The shape of y^e two sides is essentially different; y^e right side is flatter than y^e left & y^e left Ventricle appears thicker than y^e right. Next observe y^t y^e ventricle is both longer than y^e auricle w^t y^e same, & y^e right side of y^e heart is longer than y^e

left

all, but yt difference is not so great as it appears by
from yt text not yielding so readily to yt force of yt
injection. Haller has corrected a mistake
of Malpighius wt regard to yt appearance of yt
coronary Arteries in yt Heart, yt they are not
originally at a distance, but come off from
Aorta behind its Valves. We see also a satisfactory
Boerhaaves account of yt alternate action of yt
heart, from yt principal branches of yt nerves
running in about yt trunks of yt great arteries
& being compressed by them, for no sooner more
branches went off to yt heart, which do not
come near to yt arteries. At yt Semilunar
valves, yt arteries are not circular, but are
composed of three segments of a circle, or there
are bags behind yt Valves into which yt blood
enters in order to shut them. These have
been called Sinuses by Valsalva, & they are
to be found in yt mouth of yt Pulmonary as
long, as well as in yt mouth of yt aorta, &
this swelling is not yt more effect of use
but is an original Structure ~ o

We next examine yt structure of yt
arteries & veins. The cul vide of an artery

assigned

appearo of a half opaque colour; & on y^t. surface we
find threads like those of Cotton y^t. conneal it to
y^t. neighbouring parts, & going deeper we find those
threads of Cellular substance mixed together, &
forming this opaque coat as we find a coat formed
by y^t. Cellular substance condensed, so as to put on
y^t. appearance of a membrane, so we shall call this
outer coat membranous. when y^t. is removed as
said within its fibres laid transversely, or cross
lastly, & there constantly of a pure red colour, pur-
ler than y^t. flesh of y^t. part to which they belong
just as y^t. fibres of y^t. Muscularly coat are purer
than y^t. external muscles. (perhaps not one of these
describes a compleate circle, but latina y^t. gen^l
disposition & they are called very properly circu-
lar). They are connected to each other by Cellular
membranes, so y^t. air blown under y^t. outer
membranous coat passes into their Interstices.
When we said within this coat a very thin
transparent one not unlike y^t. thin white in
lines y^t. shell of an egg; may it is not by any
means tough, it does not resist much, it
can easily tear it, but it is every where ex-
tremely close or (dense), so y^t. liquors do not

easily

easily perceive them. This is y. immediate cause of 96
coal, for as long there is no manner of reason for
applying y. term Vitreous for expressing it
y. Blood are concealed by y. common Cellular
substance, which is as much between y. pericar-
coal & y. Internal, as between y. membranous
& y. muscular, but y. threads are smaller,
between these coal there never is so perfect
y. coat is merely cellular w.out coal being observ-
In some of y. larger arteries, y. Circular coal
may be split into a number of different layers
as I have divided y. fibrous coat of y. aorta
into 5 different layers, but you are to consider
them to be one.

Next I am examine y. Coats of y. veins
In smaller veins y. coats are so thin & trans-
parent y.t we find it very difficult to separate
them, but going nearer y. heart, y. separa-
tion is made more easily. In y. trunk
y. Vena Cava comes to particular y. struc-
ture of y. structure of y. ~~heart~~ auricle, we
see y. fibres distinctly, & y. motion is evident
in dissecting Animal. But having y. Vena
Cava inferior below this part, we find a more

transparent

transverse coat, composed of cellular membrane condensed. Within yt we see a medullary substance called coal, in which we distinguish longitudinal, as well as transverse fibres, but both very fine, not laid in so loose bundles as in yt Arteries, so yt from yt small diameter & yt closeness wt which they are joined they have less of yt appearance of a muscle. Then we find yt internal coat as in yt artery, but wt this difference, yt in yt vein it is joined to yt outer coat by a much looser cellular substance, & it is more elastic & stronger, it does not tear so easily, & upon stretching it, it draws in wt considerable force, so yt chiefly of yt veins depends upon their inner coat chiefly, whereas in yt arteries it depends upon their outer coat. Ye Veins have Valves wt in them formed of yt inner membrane doubled wch had two Valves together; each of which covers half a circle so yt they shut yt passage completely. —6

I shall not trouble you with any further observations of yt heart & arteries. 1st the forecandium consequent adhering to yt heart. 2d a complete dissection

tion

lum, or any matter in ye Valves of ye Aorta, &
only a small hole left for ye passage of ye blood.
The heart at ye same time a great deal larger
than natural, & double ye usual weight.

3 Ossifications found into ye arteries, in
such cases generally pretty in ye heart.

4 A dilatation between ye heart & ye arch of
ye Aorta, or an Aneurism of ye aorta, also a large
hole leading to a bag, or sac, which proceeds
upon ye thoracic, in ye inches small gut by
which ye patient emptied ye blood by vomiting.

5 Ossifications extending along ye coronary ar-
teries, ye Ventricles thicker, at ye same time
the person died in a moment after eight com-
plaints in ye breast.

6 And we find ye parts of ye heart Sanious
blood; as ye Auricle, ye Ventricle, ye Septum be-
tween ye Ventricles, a suppuration about ye
Septum, & a considerable quantity of pus found
ye patient laboured under (Peripneumonic)
Symptoms.

7th Dilatation & rupture of ye arteries in
ye Aorta Abdominalis, & in ye femoral artery.

Lecture 45

contraction

vessels

[illegible] would suppose if a Schirrus may take place in the coats of our veins, or if a Gangrene may take place [illegible] of both these before we become of the [illegible] if our [illegible] [illegible] [illegible] tion; & this perhaps ending in Gangrene we cannot [illegible] coat, which may be [illegible] the [illegible] matter appears [illegible] [illegible] seal'd [illegible]

[illegible] still another [illegible] of Inflammation, which has not been sufficiently attended to, [illegible] suppuration, Schirrus & Gangrene, he may cut off by death, from the inflamed organ affecting the Nervous System. If the veins (the coats of our aorta touched with some caustic dissolved the whole) N. B. so as to render the muscles unable to perform their usual operations

upon it, w.ch when a very accurate Inspection has been
[illegible] to us [illegible]
[illegible] Inspection
[illegible] at it open into a
[illegible] with more extraordinary [illegible]
[illegible] into it. Into
[illegible] by [illegible]
opposite one, just as
[illegible] Should
[illegible] in such
[illegible], it ought in reason [illegible]
[illegible] by Inspection [illegible]
[illegible] to [illegible]
[illegible]. The [illegible]
[illegible] at [illegible]
over, or two successions of Islands.
Authors on Winslow speak of Islands
[illegible] & of more under [illegible] a vast
[illegible] an Island, known by [illegible]
but of very little use in time of
publick System. The Islands in view
a number of Islands, as it proceeds
wards the [illegible], & every where [illegible]
Course

them. We perceive in general that there must be
circulating thro' certain channels which divide
system into certain parts & in many parts of
the body where there are small vacuo, there must
inhaling & exhaling veins to carry on
circulating arteries. how from there being
of veins, we shall find a sufficient
a variety of application

shall begin with opinion of Modern
the Writers. They explain'd circulation
[illegible] circulation
[illegible] circulation inarteries, which
[illegible] other by communication
in [illegible]

[illegible] will be equally, or still more perfect than
[illegible] have of Systematic Writers explain'd
[illegible] calculate for fluids thrown out into
reach of heart by pulsing impediate motion
[illegible] We have that not rather more
[illegible] in proportion
[illegible] the Vein! in not this System

[illegible] it. Lastly we must [illegible]
they conceive this new System to have [illegible]
Inhabitants [illegible] that must needs [illegible]
necessarily. But let us [illegible]
to make [illegible]
y. several arguments by my opponents
alive.

And first before we proceed to establish
a new opinion, it is [illegible] y.
y. old one be examined, as we are apt to
judged by it. Let us see what has led
him into y. idea, y. y. red veins encrust-
ted y. red part, y. lymphatic vessels, y.
inhabit part, & y. all y. absorbed liq-
uite y. reducing. The History of Anatomy
will be explain this. The lymphatic System
was only generally known in y. nic
y. last century, [illegible]
Now (doubtless) since it, but what
generally overlooked, or misunderstood.
Authors therefore for a long time conceiving
y. red to be y. only veins in y. body, therefore
applied to them every purpose y. veins can
be supposed to serve, & as Dr Harvey about

Different explanations of these appearances.

Thus he (Cooper) was so much afraid, that he tells us if no man in his senses could pretend to doubt of the fact, & unless Cooper himself had shewn a mystery in his experiments, or others persons had attended to them more particularly the argument seems very conclusive, but we can give a very different explanation to these appearances.

And first how (do we find us) globules in the thoracic duct, whence (do they proceed. To explain this we must either suppose that the small branches of the circulating System are ever naturally dilated to take them in, that there is an inner coat, that the globules pass into the cells naturally that their whole (course), or we must suppose that the blood is effused, & that by the violence done, veins are torn, & that globules enter by the lacerated parts, or by that the globules are effused from the arteries, & again sucked in by the absorbent veins. Now if we admit this last supposition, we give up the argument, as we conceive that the lymphatics are absorbents, & yet the globules are naturally communicated that way, so that in speaking of the texture of the blood, it appeared that

y^t y^e colour & shape of y^e globules have no manner
of connexion y^t y^e colour remains tho' y^e globules
are broke down; & therefore we may suppose an
absorption of red parts, so if no blood gets out
beneath my skin, y^e colour gradually changes
& y^e yellow colour of y^e serum remains after y^e
red is gone; y^e red part being taken up rather
more readily. We observe what happens in slight
Inflammations, as in y^e eye, you'll soon see
y^e clear reflects of y^e Cornea dilated, as also
in red blood, for where red reflects are seen on
y^e Conea, there is a new growth from y^e white
part of y^e eye, gradually extending on y^e
cornea. but y^e original reflects do not admit
of red blood, so y^e extremities of our reflects
are (as no means be easily dilated, as Mallows
are (as no means be easily dilated, as Mallows
conceive); but we see either y^e red parts
absorbed, or there is a laceration of reflects
so there is perhaps a real effusion of red
blood in y^e Cellular substance of y^e eye
as where an accident happens to it, it's sad
pain, & even where there is Inflam^n
& pain, we have strong marks of effusion
so where I have raised Inflammation

on

in pursuing the transparent parts of groups, and
shewing the effusion of red
parts.

I strengthen this observation by the
instances of those in the Thoracic Duct: Hessler
is chiefly quoted with respect to this fact; & he by
giving Corrosive Sublimate to animals in large
quantity procured the most dreadful symptoms
& following the descriptions of the dissections he
made, we find that there was a vast quantity
of coagulated blood at the end of the mesentery, & there
was such a laceration of many parts of the
might easily enter. But I have now made
many more experiments upon this question
than you will find in any author, & have
observed this redness in the Thoracic Duct
in 110 different animals, & find that it
can be produced by making a large wound
in the abdomen, or by producing in
any shape a great irritation of a vessel
any organ, it is not confined to any organ, but
whether you inflame the Spleen, the Liver, the
stomach, the Guts, or any muscle, there is a
swelling, an effusion of blood, & a red colour

of

of y^e lymphatics proceeding from y^e part. 1541

Now let me endeavour to explain what 2^d
happens in injection, as when Mercury forc'd
into a valvular lymphatic, Sanctorius Sanctor.
Nuck, whom have been chiefly guided, Sanctor
tells us y^t he has often injected Mercury into
y^e Spermatic artery, & filled y^e corresponding
lymphatics, but could not get it into y^e opera-
tion red vein. How what explanation can
be given of this? If you conceive a continuation
of vessels, why does y^e red blood pass into y^e
red veins in life? or why does not y^e Mercury
pass into y^e red veins? Nuck again men-
tions other circumstances, re injecto y^e opera-
tion arteries, finds y^e lymphatics filled
but observed first that those were vesicula-
quadam filled first, The injection had
burst into y^e Cellular substance & y^t not
knew from a hundred experiments to be
this, y^t if you inject an artery with a very
penetrating liquor, & with great attention
so as to fill y^e corresponding veins, we
may give y^e full colour to y^e parts without
filling any lymphatic, but if you take

a

a subject beginning to putrify, & y^t parts tender
y^n much y^t injection will a sudden violence, as to
be burst y^t branches of y^t artery, & y^t liquors
pushed into y^t cellular substance, are effected
every where, you succeed in filling many
lymphatics without a single drop of y^t injec-
tion passing into y^t corresponding veins, &
on cutting open y^t bowel, can sometimes
see y^t place at which y^t injected liquor has
got into y^t lymphatic, but for y^t most part
it is impossible to demonstrate this, & there
fore where we produce this redness of y^t
lymphatic, either y^t matter effused into y^t
cellular substance enters by y^t lacerated
branches of y^t lymphatic vessels, or if y^t
blood has stagnated for a length of time
& y^t red parts are melted down, they may
be taken in by y^t open mouths of y^t lym-
phatic vessels, it is evident therefore
y^t Authors have drawn a wrong con-
clusion from y^t observation & experiment
but I do not mention this as any proof y^t
y^t lymphatics are absorbent vessels,
for their branches are generally lacera-
ted

Let us next then see if there are any arguments to disprove us to believe yt. yt. lymphatic arteries terminate in yt. lymphatic veins. This appears very plausible at first sight; but what purpose is to be served by such a distribution? Nature gives us no more of yt. lymphatic & serous part of yt. blood than is sufficient for yt. nutriture. In yt. extremities of yt. arteries a separation of certain parts of yt. lymph from yt. red mass is necessary, but as soon as these parts have served their purpose of conveying nourishment, sufficed, or of making circulation, we see no reason why yt. liquor should not be immediately returned to yt. red veins, & as yt. red arteries divide into coloured & colourless branches, why not suppose yt. yt. veins begin in yt. very same manner yt. lymph is necessary near to yt. heart & in yt. large vessels, to give yt. fluidity to yt. blood, surely a greater quantity is necessary in its return towards yt. heart, & nature must send as

so much so ye necessity of things required, or
we see an evident purpose why ye red & colour-
less parts should be again blended together.
Or let us reason in another way, let us ex-
amine any of those organs, where there is ye
least of ye red colour in ye body, & we find
yt ye veins coming from those have a smaller
proportion? they are equally large, & ye sym-
phatics are by no means larger, may we
may give instances where wt out doubt
ye lymph goes into ye red veins, as in ye
eye. In ye eye of a child in ye anterior
cap. Crystallinæ here ye convex ye red blood
& that those afterwards become too small
to admitt ye globules, do they not continue
to veins ye humours in ye same way. Or let us
observe what takes place in Fishes, as
ye Cod or Skate, which have a few organs
of a deep red colour, but all ye rest colour-
less. Where ye colourless arteries return
their contents by colourless veins, ye propor-
tion of ye red veins should be very small
whereas we see ye same proportion observ-
ed in those Animals, as in Man, so there
is

in no purpose answered by their being distinct
in their course, but every circumstance seems
to shew, y^t. y^e. colourless arteries, as well as
y^e. coloured form y^e. reducing, & hence y^e. lym-
phatic seem serve a different purpose of
absorption:

But not to rest that argument here
let us next weigh y^e. several proofs y^t. shew
y^e. lymphatic vessels to have no immediate
connexion w^t. y^e. arterious system; but to
begin by open mouths. I^st. Survey you are struck
w^t. y^e. analogy of y^e. tracheal, which is com-
plete in every circumstance: as to y^e. valves
structure of their coats, which are thin, tough
& transparent, we find them both passing
thro' glands, which argue perfectly, whether
we consider y^e. shape, colour or consis-
tence, we find y^e. vessels in a similar
way passing along their surface, & thro'
them, & they have one common termination
in y^e. thoracic duct, or like y^e. tracheal
we must suppose y^t. they begin by open
mouths, in tho' we consider y^e. valves
structure more particularly, why

Lymph^s. begin by open mouths I^st. Argu^t
II Their valvular Structure

Why have nature created these vessels w.ch carries
when we see, are to be found in y.e red veins!
In y.e red veins there is a litle a longe of y.e heart &
arteries pushing on y.e blood, & a few valves are
sufficient to determine y.e fluid to y.e heart!
if a muscle acts, but in y.e lymphatic veins
y.e push is wanting behind, so more assistance
is necessary, y.t every y.e smallest pressure, whe-
ther of a muscle or artery, may assist in driv-
ing y.e fluid onwards. As to give a practical
proof of y.e effect of y.e valves, if I have inject-
ted a lymphatic w.th Mercury, I must take
care how I handle it, as y.e slightest touch
drives y.e Mercury beyond y.e next pair of valves
so y.e lymphatics therefore are better filled for
having advantage of y.e pressure of y.e neigh-
bouring organs, we are led to conceive y.t
they need this pressure more, y.t is, that
they have a different origin. Further to
us attend to y.e ducts of y.e glands, y.e pan-
creatic or salivary ducts, begin w.th branches
as minute as y.e supposed beginnings of
y.e lymphatic arteries & yet these have
no valves, because there is y.e urine to

to

3d motion of Lymph in these continues tho' d. Ar.y stood

I shall now see what happens in a living Animal & here I would request to have every Author who conceives y.e Lymphatics to convey from y.e intestines, they speak of them as containing to be filled, as long as a degree of warmth & contractility continues in y.e part or as long as y.e tactals continue to be filled. the flow continues equally the whole time of y.e artery.

4th nature of their contents the same as of y.e liq. exposed where they take their rise

Sept. I would discover y.e resemblance, which y.e liquors contained within them, have to those in y.e part from which they come. In many parts of y.e body, there is such a vast profusion of fluids, y.t we cannot (now every conclusive argument here, but I have examined this matter in y.e liver with particular attention, & I allege as a fact y.t y.e bile of Animals passes in a certain state, but more readily when its ducts are obstructed into y.e lymphatic vessels, as to give a colour & a very strong taste to their contents so y.t all doubt y.e matter of y.e lymphatic vessels begin from y.e cavities or receptacles of y.e bile.

So)

In this we may see many observations, which we can make in different diseases, & which is very useful to attend to. That wherever any matter, whether of disease or medicine is absorbed, there is a danger of swelling being produced in ye conglobate glands between it & ye heart, not in those nearest it, but in those which are in ye way of ye lymphatic vessels. So if we apply a blister to ye neck, we do not find ye conglobate glands immediately about ye blister at all swelled, only those between it & ye heart. In like manner if we apply a blister to ye groin then ye Inguinal glands, those can't swell, but if we applied it to ye foot those glands generally swell, tho' not always some being more irritable than others. In like manner we can trace ye course of ye mercurial poison, in ye common manner in which buboes are produced. You will find ye all ye buboes you have seen, were at ye upper part of ye Inguinal glands, very near to ye tendon of ye external oblique, yet ye whole glands were equally near to ye place of infection, & they all receive ye same nerves

&

Vol 4
Acrid matter both of disease & medicine absorbed occasions a swelling of ye conglobate glands between it & ye heart not in those nearest ye place

& circulating vessels, & we cannot explain this
by supposing yt. ye Venereal poison is directly
translated thro' ye lymphatic vessels into their
particular glands, I have in fact found it so
in discasing subjects, & I have traced them from
ye penis into ye upper part, I have traced them
like cords under ye Integer, running into or
very near to ye Inguinal glands. But if an
irritation be applied lower than this, not ye upper
part of these glands is affected, but ye under; ye
Lymphatics of ye Clitoris, & ye have received
ye infection from a Child at ye nipple, ye glands
of ye axilla swell, & in like manner Surgeons
who happened to have a scratch on their fingers
have had ye glands of ye axilla swelled
from dressing Venereal patients, & where ye
Child receives it by sucking ye mother, there
of ye necks are affected. In like manner
if a Cancer breeds in ye breast, it always
affects ye glands of ye same side. So there I
might add a variety of cases of assimilation
from these irritating causes for ordinary
as ye of Scrophula, where that takes place
in ye knee or foot, we find ye glands swelled
in

in y^e Arm pit &c. Vide Malpighii et Ruyschii
Histories of this kind, who calls y^e Glandules
vesicles 5. I have only one proof more to
add y^t when a strong smelling substance
as Camphire is applied to any part of an Animal
constantly find y^t y^e lymph receives y^e taste
from it, I could entirely what will appear
still more clear instances of this, y^t more than
one Author have described y^e mouths of
y^e lymphatics as visible to y^e naked eye
as al y^e carpal glandulæ, where by blowing
into them, they have filled them upwards
how without ever having made an experim^t
I should reject such a supposition, for in
this y^e case, these substances would enter
our lymphatic System, y^t could not get
thro' y^e Circulating, but would stick in y^e
extremities of y^e arteries. But I know y^e
case to be thus, when I have tried to inject
y^e mucous ducts of y^e urethra w^t Mercury
I find, these are very thin & tender, so they
are lodged in a very loose Cellular substance
so y^t they readily burst, & y^e liquor getting
out, at a hole in them, runs [illegible]

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lymph receives taste & smell by an absorbent applied to an Orif. of

no. Ref. to be taken on Authority having seen the mouth of lymph. Vs. by Lympha

163 C (ult)

Repaired 1928

Really iii + 332 + 165
for 64 in 1st foliation
is double + 163 in 2nd is treble.